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MÜLLER (K. O.). **Über die Abbauresistenz der Kartoffel und die Züchtung abbaufester Kartoffelsorten.** [On the resistance of the Potato to degeneration and the breeding of degeneration-resistant Potato varieties.]—*Z. Zücht. A.*, xxiii, 1, pp. 1–19, 6 figs., 4 graphs, 1939.

A detailed, tabulated survey is given of the writer's experimental studies, which have now been in progress for a number of years at the Biological Institute, Dahlem, Berlin, on breeding potatoes for resistance to degeneration, bringing the results up to 1938. The outcome of the investigations may be summarized as follows. The varieties Erdgold and 9089 (a Dahlem selection of South American origin cultivated locally for ten years in succession) are heterozygotic in their reaction to leaf roll and streak (Y) [*R.A.M.*, xviii, p. 409], hence the extreme variability in this respect of the progeny of crosses between the two. The selfed family of 9089 showed much less conspicuous symptoms of leaf roll than that of Erdgold, while the hybrid offspring occupied an intermediate position. On the other hand, the differences between the two selfed families in regard to the development of streak were relatively insignificant. The time of appearance of the initial leaf roll symptoms varied appreciably (from the first to the third year of cultivation) among the members of 'full-sister' series. There was no diminution in the severity of streak occurring for the first time in the second or third years as compared with the first, and the same presumably applies to leaf roll. Since resistance to degeneration is transmitted not only through the egg cell, but also by way of the pollen, and as reciprocal combinations of susceptible and resistant forms showed no differences beyond the limits of experimental error, variations in individual reaction cannot be attributed to plasmotypic modifications but are probably genotypically conditioned. The reactions to leaf roll and streak are independently inherited.

The value of different commercial varieties for breeding purposes was shown by hybridization tests to be very divergent. For instance, in the Erdgold × 9089 cross, not one of the seedling descendants was superior to the latter parent in its resistance to streak or leaf roll, whereas the combination of 9089 and Ackersegen gave rise to individuals far surpassing both parents in resistance to degeneration, especially as regards the Y virus. Evidently the accentuation of resistance is a result of a blend of genes occurring separately in the two parents. Experiments in the cultivation of 9089 hybrids at localities outside Dahlem showed that the primary genotypical reaction of a variety to leaf roll or streak may

be more or less modified by environmental conditions: 9089 itself, in fact, may 'roll' conspicuously in unduly dry soils, though at Dahlem it has consistently proved highly tolerant of the leaf roll virus. These observations lend support to Merkenschläger's 'ecological' theory of degeneration [ibid., xvi, p. 400].

The incidence of infection and virulence of symptoms varied independently of each other, so that there are obviously no genetic correlations between the degrees of resistance, expressed by fewness of diseased plants, and tolerance, manifested by mildness of symptoms. The climax of the 'degeneration minimum' and the rapidity with which it is reached are determined by the two factors, resistance and tolerance: the greater the tolerance, the smaller is the difference between the normal yield and the 'degeneration minimum', and the higher the resistance, the more slowly is the 'degeneration minimum' approached. Like the degrees of tolerance and resistance, the extent of the 'degeneration minimum' and the rapidity with which it is reached are genotypically conditioned, though important modifications in the natural trend may arise through the varying incidence of insect vectors of the viruses and the amount of infestation in neighbouring stands.

The breeding material under observation has demonstrated the possibility of combining resistance to degeneration with the following characters: medium-early to latest maturity, resistance to wart disease [*Synchytrium endobioticum*], productivity, correct tuber shape, short stolons, and resistance to *Phytophthora* [*infestans*] (biotype group A) [ibid., xvii, p. 483].

Details are given of the field performance of two 9089 hybrids, viz. (Erdgold × 9089) 100 and (Deodara × 9089) 10. The former is tolerant of leaf roll, resistant to Y, and surpasses the best commercial varieties in long-continued productivity in heavily infested areas. The latter is similar to the foregoing in its reaction to leaf roll but immune from, or very highly resistant to, Y, of which not a single case was observed in five years' cultivation at Dahlem, nor did any of the 24 tobacco plants inoculated with the expressed juice give positive reactions. There are also indications (requiring further confirmation) that 9089 is both tolerant of, and resistant to, mosaic (X virus).

Some practical recommendations for breeding are made on the basis of these results. Forms must be developed, by inbreeding or rational hybridization, possessed of far-reaching homozygosity in respect of resistance to viruses. Genes conferring this quality will be found among certain widely cultivated commercial varieties, local sorts, and numerous old selections which have long disappeared from the market but are available in the 'relic collection' used for demonstration purposes by the Reich Food Board. While the development of forms with a high degree of resistance to, or even immunity from, mosaic and Y is a possibility, tolerance of leaf roll is apparently the best that can be anticipated [ibid., xvi, p. 487 *et passim*] at the present stage of knowledge of the disease. The Reich Food Board now undertakes degeneration trials on the same lines as those for wart disease, and growers would be well advised to take advantage of this arrangement, whereby they can immediately be relieved of all susceptible seedlings and retain only such material as promises to be of real value in the work of selection.

Leszczenko (P.). & Kuryluk (W.). **Badanie odpozności Ziemniaków na raka ziemniaczanego Synchytrium endobioticum Perc. Sprawozdanie VI.** [Testing resistance of Potatoes to the wart disease *Synchytrium endobioticum* Perc. Report VI.]—*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk., Bydgoszcz*, 18, pp. 77–86, 1939. [French summary.]

As a result of further testing of potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xvi, p. 832] the Polish varieties Herulia, No. 190 Stiegler, and Śląskie Różki are stated to be resistant as well as the foreign varieties Carnea, Novifolia, Sieglinde, Edelgard, Edelragis, Frühbote, Stärkeragis, Viola, Tannenzapfen, Weltwunder, and Krebsfeste Kaiserkrone.

Piekarski (A.). **Dobór odmian rakoodpornych na Śląsku.** [The selection of wart-resistant Potato varieties in Silesia.]—*Roczn. Ochr. Rośl.*, vi, 2, pp. 19–27, 1939. [German summary on p. 38].

The standard potato varieties grown in the Polish provinces of Upper and Lower Silesia are all resistant to wart disease [*Synchytrium endobioticum*]. Ackersegen, the most popular Voran, and Mittelfrühe have yellow-fleshed tubers with a good flavour, and give the highest yields in tubers and starch per hect.; worthy of mention are the early varieties Bürckner's Früheste, Kaiserkrone, Paulsen's Juli, and Lichtblick, the medium-early Rosafolia and Böhm's Mittelfrühe, the medium-late Erdgold, Jubel, and Hindenburg, the late Ovalgelbe and Hetman, and the industrial variety Parnassia.

Raysky (D. M.). Действие мороза на конидии **Phytophthora infestans D.B.** [The effect of frost on the conidia of *Phytophthora infestans* de Bary].—*Sovetsk. Bot., 1939*, 2, pp. 93–96, 1939.

In experiments carried out during the winter of 1935–6 at the Voronezh Potato Experiment Station, cultures of *Phytophthora infestans* [*R.A.M.*, xviii, p. 271] on slices of potato and conidial suspensions of the fungus were frozen out of doors and the conidia then germinated in the laboratory at a temperature of 8° to 9° C. in the morning and 13° to 14° at midday. Exposure to low temperatures seemed to increase the proportion of conidia germinating in a vegetative manner. The conidia withstood temperatures of – 26·5° for seven days (46 out of 100 germinated) and – 13·2° for ten days (35 out of 100 germinated). Most of the zoospores liberated from the conidia were killed after ten minutes at – 11·3° and all after half-an-hour.

Yabuta (T.). & Hayashi (T.). **Biochemical studies on 'bakanae' fungus of the Rice. Part II. Isolation of 'gibberellin', the active principle which makes the Rice seedlings grow slenderly.**—*J. agric. chem. Soc. Japan*, xv, 3, pp. 257–266, 8 figs., 1939. [Japanese, with English summary on pp. 41–42.]

By means of an elaborate chemical technique [which is described in detail] the writer, at the Imperial Agricultural Station, Tokyo, isolated in a crystalline state the stimulatory substance of the 'bakanae' (elongation) fungus of rice (*Gibberella fujikuroi*) [*R.A.M.*, xviii, p. 54].

The final product, for which the name 'gibberellin' is proposed, is an almost colourless, amorphous powder, producing the characteristic effects of the disease on inoculation into rice seedlings even in such minute amounts as a 0·00002 per cent. solution. It soon loses its potency in an aqueous alkaline solution, but is fairly stable in an acid one. T. Yabuta and Y. Sumiki have recently resolved the crude amorphous gibberellin into two distinct crystalline substances, both active for rice plants, by fractional crystallization from ligroin mixed with ethyl acetate or ethanol: one (A) occurs as long prisms, m.p. 194° to 196° C., and the other (B) as short prisms, m.p. 245° to 246°.

INOUE (Y.). **Comparison of the cellulose-decomposition by culture strains of the Rice blast fungus, Piricularia oryzae Br. et Cav.**—*Ann. phytopath. Soc. Japan*, ix, 1, pp. 33–40, 1939. [Japanese, with English summary.]

Of the 21 strains of *Piricularia oryzae*, the agent of rice blast [*R.A.M.*, xviii, p. 580] in Japan, compared on a cellulose-containing synthetic agar medium for their cellulose-decomposing properties, nine were very active in this respect, three definitely weak, and the remainder intermediate. Generally speaking, a strong capacity for cellulose disintegration was correlated with a high degree of pathogenicity to rice.

HERZOG (GERDA). **Über den Einfluss der Dämpfung auf die biologischen und chemischen Eigenschaften der Gartenerden.** [On the influence of steaming on the biological and chemical properties of garden soils.]—*Bodenk. u. PflErnähr.*, N.F., xii, 5–6, pp. 339–384, 9 graphs, 1939.

In connexion with an exhaustive study on the influence of steam sterilization, mostly carried out with the Pillnitz apparatus described by Noll [*R.A.M.*, xvi, p. 124], on twelve horticultural soils in the Leipzig and Pillnitz districts of Saxony, the writer refers to the reaction of [unspecified] soil fungi to this treatment. In acid soils (P_H 4·7), used for heath (*Erica*) and azalea [*Rhododendron*] cultivation, the steaming was followed by a sharp increase of fungal activity, the number of fungi rising from 10,000 and 100,000, respectively, per gm. of soil to 1,000,000 and 5,000,000, respectively, by the 42nd day. In alkaline soils, on the other hand, the number of fungi counted 42 days after sterilization was only a fraction of the original population, especially in the autumn and winter months [ibid., xii, p. 721; cf. also xiv, p. 121]; in the summer the figures were somewhat higher, but at no time was the intensive multiplication characteristic of acid soils observed in those used for the growing of cyclamen (P_H 7·8) and chrysanthemum (7·6).

BURGES (A.). **Soil fungi and root infection. A review.**—*Brotéria*, viii (xxxv), 2, pp. 64–81, 1 graph, 1939.

In this critical review of the present knowledge of soil fungi the author discusses the occurrence of fungi as spores and mycelium in the soil, the number of fungi present, and the biologic groups of fungi represented.

KEYWORTH (W. G.). **Verticillium wilt of Hops. A summary of observations during 1938.**—*Rep. E. Malling Res. Sta., 1938*, pp. 244–249, 1 pl., 2 figs., 1939.

During the period 1924 to 1937, *Verticillium* wilt disease of hops was reported from an increasing number of farms in England, and by the end of the 1938 season it had been observed on 28 farms in Kent and Sussex, and one in Herefordshire. The varieties showing the disease are Fuggle, Tolhurst, and Tutsham, as well as other Golding varieties and two Wye seedlings. The only constant symptom is the light brown colour of the wood in a severely affected bine, the discoloration extending from the base at least 18 in. up.

While the cause of hop wilt was ascertained by Harris to be *V. albo-atrum* [*R.A.M.*, xv, p. 741], hops in three gardens were found in 1938 showing the same symptoms though infected by *V. dahliae*.

On some farms a fluctuating type of infection occurs, the disease varying in intensity from year to year, while on others the disease is progressive, the hills dying within a year or two after developing the symptoms. The evidence indicates that the disease is probably spread through an infected garden by the cultural practices adopted. Thus, in a square-plant garden cultivated in both directions, in which the disease first appeared as a patch of 20 hills in 1934, the diseased hills were evenly distributed all over the garden by 1938; in a Worcester-plant garden cultivated in one direction only, in which the disease broke out in one patch in 1936, spread took place almost entirely in one direction from the patch. As infected bines contain mycelium throughout their whole length and as the soil round a diseased hill is infected, it appears to be probable that infection is spread by workers carrying diseased material about; the disease may also be spread from one garden to another in this way. Dissemination is also effected by the use of infected bine as manure.

Control measures recommended include the burning of bine from infected gardens, not planting hops adjacent to or after potatoes or raspberries, and the avoidance of setts from diseased gardens. [This paper is reprinted in *J.S.-E. agric. Coll. Wye*, xliv, pp. 23–29, 1 pl., 2 figs., 1939.]

OCFEMIA (G. O.) & CELINO (M. S.). **The behaviour of POJ 2878 Sugar Cane in relation to Fiji disease and transmission of the virus by nymphs of Perkinsiella vastatrix.**—*Phytopathology*, xxix, 6, pp. 512–517, 1 fig., 1939.

Among apparently healthy stalks of P.O.J. 2878 sugar-cane selected from a field at the Los Baños College of Agriculture, Philippine Islands, two produced shoots of which some were infected by Fiji disease [*R.A.M.*, xviii, p. 626] and others apparently healthy. The latter did not originally contain the virus of the disease, but readily became contaminated by it in transmission experiments with *Perkinsiella vastatrix*, of which not only adults but also nymphs of the second to the fifth instars can convey infection. On the other hand, nymphs hatching from eggs laid by viruliferous leafhoppers do not carry the virus. Viruliferous adults require a minimum incubation period of 24 hours before acting as vectors of Fiji disease.

HUGHES (C. G.). **Alternate hosts of B. vasculorum, the causal agent of gumming disease of Sugar Cane.**—*Tech. Commun. Bur. Sug. Exp. Stas Qd, 1939*, 3, pp. 35–63, 1 col. pl., 11 figs., 1939.

This is an expanded account of the writer's studies in Queensland on the host range of *Bacterium vasculorum*, the agent of gumming disease of sugar-cane, a note on which has already appeared [*R.A.M.*, xviii, p. 624].

PADWICK (G. W.). **The genus Fusarium. I. Known occurrence in India.**—*Indian J. agric. Sci.*, ix, 2, pp. 171–184, 1939.

With the object of opening the way for a study of the Indian species of *Fusarium*, the author presents a fully documented list of the species of this genus known to cause diseases in India. He then critically examines and discusses the reasons on which various workers have based their determination of species, and concludes that for the present it is desirable to accept the classification of Wollenweber and his associates. As few new species as possible should be created, and the use of new biological characters, such as host reaction, to delimit species should be avoided.

MAINS (E. B.). **Rusts from British Honduras.**—*Contr. Univ. Mich. Herb.* 1, pp. 5–19, 1939.

An annotated list is given of 58 species of rusts [including ten new ones] belonging to 11 genera found in British Honduras.

HIRSCHHORN (ELISA). **Las especies del genero 'Ustilago' en la Argentina.** [The species of the genus *Ustilago* in the Argentine.]—*Darwiniana, B. Aires*, iii, 2, pp. 347–418, 6 pl., 6 figs., 1939.

A critically annotated list is given of 44 species (one new) of *Ustilago* found in Argentina. The author restores or refers several species of *Sphacelotheca*, including *S. hydropiperis*, to *Ustilago*.

TAVARES (I.). **Catalogo dos fungos de Pernambuco.** [A catalogue of the fungi of Pernambuco.]—*Bol. Agric., Pernambuco*, iv, 1, pp. 1–33, 58 figs., 1939.

This is an annotated list of 58 lignicolous Polyporaceae of the Pernambuco district of Brazil, mostly collected by B. Pickel and determined by C. Torrend.

ULBRICH (E.). **Neue Arten von Nanga Parbat leg. C. Troll. Fungi. Nachtrag zu Pucciniaceae.** [New species from Nanga Parbat collected by C. Troll. Fungi. Addendum to Pucciniaceae.]—*Notizbl. bot. Gart. Berl.*, xiv, 124, pp. 343–344, 1939.

Since his erection of the genus *Trolliomyces* to contain the rust formerly known as *Puccinia rosae*, but differing from other representatives of *Puccinia* in its bi- or tricellular teleutospores and in the production of pycnidia [*R.A.M.*, xviii, p. 59], the writer's attention has been drawn to the prior establishment by H. Sydow (*Ann. mycol., Berl.*, xix, p. 167, 1921) of the monotypical genus *Teloconia* for the same fungus. *Trolliomyces* therefore becomes a synonym of *Teloconia* and the

rose rust should in future be known as *T. rosae* (Barcl.) Syd. (syn. *P. rosae*, *P. kamschatkae* [ibid., xiii, p. 185], *Phragmidium rosae* [loc. cit.], and *Trolliomyces rosae*). The unicellular, broadly ovate to subspherical spores, 36 to 40 μ in diameter, found sparsely scattered among the teleutosori of the Himalayan collections of the rust are believed to be the hitherto unobserved uredospores.

BUCHWALD (N. F.). **Fungi Imperfecti (Deuteromycetes). En Veiledning i studiet af de sekundære Sporeformer hos Svampene.** [Fungi Imperfecti (Deuteromycetes). A guide to the study of the secondary spore forms in fungi.]—ii+144 pp., 1 pl., Copenhagen, K. Vet. Landbohøjsk., 1939.

This book has been written mainly for the use of the students at the Royal Veterinary and Agricultural College, Copenhagen.

Many fungi play their most important role while still in their imperfect condition, but the little systematic attention paid to fungi in this state has been quite out of proportion to its great practical significance. The author seeks to provide students with a systematic basis for their studies with the microscope. The introduction presents an objective account of every attempt that has been made to classify fungi in their imperfect state. Keys are provided for the accepted families and subfamilies and for the selected genera, and the recent literature is cited under each heading. The species listed are especially the Scandinavian phytopathogens, but all genera of significance to applied mycology are introduced, whether they appear as human and animal pathogens, or occur in pharmacies, fermentation work, or on textiles or foodstuffs.

The bibliography at the end cites all the key systematic books, manuals of plant pathology, and periodicals of mycology and phytopathology; there is also a full authors' index, and an index of generic names. The book provides an admirable guide for the student who desires to become well informed about the literature on Fungi Imperfecti as they are known up to the year 1939.

DA CÂMARA (M. de S.) & DA LUZ (C. G.). **Some fungi from the Atlantic islands and the Portuguese colonies.**—*Bol. Soc. broteriana*, Sér. II, xiii, pp. 95–99, 4 figs., 1938. [Received August, 1939.]

The following and two other fungi are recorded in this list: a fungus on coffee from St. Thomas island, West Africa, doubtfully referred to *Hemileia coffeicola* [*R.A.M.*, xiv, p. 303], *Tilletia horrida* on rice in Portuguese India, *Diplodina* [*Didymella*] *lycopersici* on tomato in Funchal, Madeira, and *Gloeosporium* [*Colletotrichum*] *lagenarium* on vegetable marrow in the Azores.

DA CÂMARA (E [M.] de S.) & DA LUZ (C. G.). **Mycetes aliquot Lusitaniae II.** [Some fungi of Portugal II.]—*Agron. lusit.*, ii, 1, pp. 41–63, 1939.

This second instalment of the writers' annotated list of Portuguese fungi [cf. *R.A.M.*, xvi, p. 563] comprises 75 species, nine of which are new to science. Parsley leaves were found to be attacked by *Cercospora petroselini* and those of begonia by *Oidium begoniae* [ibid., xv, p. 443], both new records for the country.

CHARLES (VERA K.). **Noteworthy Florida and Georgia fungi.**—*Plant Dis. Reptr*, xxiii, 8, pp. 130–133, 1939. [Mimeographed.]

An *Oidium* causing a conspicuous powdery mildew on leaves of papaw in Florida corresponds morphologically to *O. caricae* [*R.A.M.*, x, p. 554] but develops on the upper surface of the leaves instead of the under. This fungus should not be confused with *Ovulariopsis papayae* [ibid., xii, p. 680], which has considerably larger, subclavate conidia, singly borne.

CHRISTOFF (A.) & CHRISTOVA (ELEONORA) Нѣколко нови растителни болести за България (IV приносъ). [Some plant diseases new to Bulgaria (4th contribution).]—*Bull. Soc. bot. Bulgarie*, viii, pp. 39–49, 1939. [English summary.]

In this further contribution [cf. *R.A.M.*, xv, p. 745] the authors record for the first time from Bulgaria 21 parasitic fungi, of which the following may be mentioned; *Puccinia antirrhini* on *Antirrhinum majus* [ibid., xviii, p. 457], *Didymella lycopersici* on eggplant [ibid., xi, p. 809], *Penicillium crustosum* on chestnut [cf. ibid., xviii, p. 355], *P. expansum* on quince, pear, and apple [ibid., xviii, p. 441], *Botrytis tulipae* on tulip [ibid., xviii, p. 655], *Alternaria radicina* [ibid., xviii, p. 573] on carrot, and *Sclerotium* [*Sclerotinia*] *gladioli* on gladiolus [ibid., xvii, p. 506].

RADOSLAVOFF (A.). VII. приносъ къмъ паразитната гѫбна флора на България. [Seventh contribution to the flora of parasitic fungi of Bulgaria.]—*Bull. Soc. bot. Bulgarie*, viii, pp. 50–54, 1939. [German summary.]

This list of 32 parasitic fungi (chiefly rusts) found in Bulgaria [cf. *R.A.M.*, xv, p. 745] includes eight new records for the country.

IMAZEKI (R.). **Studies on Ganoderma of Nippon.**—*Bull. Tokyo Sci. Mus.* 1, pp. 29–52, 15 figs., 1939. [Japanese, with English summary.]

In this monographic study on ten Japanese species of *Ganoderma* (including two new to science) the author excludes the section *Amauroderma* from the genus, which he divides into three subgenera, viz., *Euganoderma*, *Elfvingia*, and *Trachyderma* based on the characters of the sporophores and their crusts.

GADD (C. H.). **Disease in non-productive bushes.**—*Tea Quart.*, xii, 2, pp. 75–83, 2 pl., 1939.

In this paper (read before the sixth conference of the Tea Research Institute of Ceylon, February, 1939) the author discusses in popular terms 'phloem necrosis' of tea in Ceylon [*R.A.M.*, xvii, p. 705], and states that the condition has now been transmitted by grafting. The slow development of the disease he considers to be one of its most dangerous features. In one experiment in a small, heavily infected area, 266 out of 639 bushes examined (42 per cent.) were found to be affected, while eight months later when the same bushes were re-examined 334, or 52 per cent. were affected. At the first examination many of the affected bushes would have appeared healthy to planters,

and at the second they looked no worse, individually. In the author's opinion, all unproductive tea bushes should be removed, as these will include the worse cases of phloem necrosis, and the condition may prove capable of causing very great damage.

GADD (C. H.). **Report of the Mycologist for 1938.**—*Bull. Tea Res. Inst. Ceylon* 19, pp. 27–33, 1939.

In this report [cf. *R.A.M.*, xvii, p. 705] it is stated that dadap (*Erythrina lithosperma*) stumps seldom give rise to root disease of tea [ibid., xvi, pp. 128, 634] in Ceylon, but in 1938 such stumps were found to have formed centres of infection for *Ustulina* [*zonata*]. When cutting out dadaps the lateral roots should be severed and as much of the stumps as possible should be removed. *Rosellinia arcuata* [ibid., xviii, p. 579], also responsible for tea root disease, was found infecting *Indigofera dosua* growing among tea, though not showing the characteristic mycelial 'stars'.

Experimental evidence indicated that tea 'phloem necrosis' [see preceding abstract] is not due to boron deficiency. If it should prove to be due to a virus it would have to be regarded as the most serious tea disease recorded. Examination of 267 necrotic bushes showed necrotic areas in the leaf petioles, stems, and roots in 65, 48, and 77 per cent. of the bushes, respectively, while such areas were found in all three parts of the same bush in 25 per cent. of the cases. Curled leaves were present on 46 per cent. of the bushes. Symptom variability may indicate that more than one disease is concerned, but in the present state of knowledge it seems preferable to regard phloem necrosis as one disease, the symptoms of which differ slightly with different tea varieties. Occasionally the disease can be recognized from the back of the leaves, where the small veins are brown and prominent. Affected bushes in the early stages of attack were noted at St. Coombs in 1938, suggesting that the disease is increasing.

The leaf fall of *Grevillea* [*robusta*] trees due to *Phyllosticta* [ibid., xvii, p. 705] has been found in several new localities. Death of the branches may result from repeated defoliations.

KEILLER (P. A.). **Note on the analysis of leaves from Tea bushes affected by 'witches' broom'.**—*Tea Quart.*, xii, 2, pp. 96–97, 1939.

Spectroscopic analysis by Dr. Judd Lewis of tea leaves from bushes affected by witches' broom [*R.A.M.*, xvi, p. 1; xvii, p. 138] on two estates in Ceylon showed in the case of one a high chromium content and in the other the presence of chromium in quantities about $\frac{1}{10}$th as great, with an abnormal amount of barium in leaves from the worst affected bush. These results are taken to indicate that witches' broom is more likely to be due to poisoning than deficiency, and that it may not always be due to the same cause. The application of potassium chromate or chrome alum was found to result in the slow death of tea bushes.

ROBINSON (J. R.). **Shape of Tobacco mosaic virus particles in solution.**—*Nature, Lond.*, cxliii, 3631, pp. 923–926, 1939.

This is a criticism of some recent contributions to the knowledge of the shape of tobacco mosaic virus particles [*R.A.M.*, xviii, p. 630] in

solution on the grounds that the capillary viscometers commonly used for this purpose are quite unsuited, by reason of their high rate of shear, for the study of anomalous systems. A cylinder apparatus, permitting simultaneous control and determination of the state of orientation in relation to the double refraction of flow and isocline angle, should be employed, and Kuhn's equation (*Z. phys. Chem.*, A, clxi, p. 427, 1932) [cf. *R.A.M.*, ibid., xvii, p. 707], which is inapplicable to particles smaller than 10^{-6} cm., replaced by a more complex formula taking account of the progressive increase of orientation as the rate of shear is raised.

FRAMPTON (V. L.). **Viscosimetric studies on the Tobacco mosaic virus protein. I.**—*J. biol. Chem.*, cxxix, 1, pp. 233–244, 1 diag., 7 graphs, 1939.

An adaptation of the Ostwald viscometer (*Kolloid Zschr.*, xxxviii, p. 261, 1926) used in the writer's studies on the tobacco mosaic virus protein at Cornell University, New York, is described. Sols containing 0·62 mg. of the virus protein per c.c. in a phthalate buffer were found to show a marked anomalous viscosity increasing with a decrease in the solution from P_H 6·37 to 5·15. At P_H 4·15 the aggregates became so large that flocculation began after the sol had been in the viscometer about ten minutes, corresponding to a point at about 300 dynes per c.c. This anomaly was greatly reduced by the addition to the protein solutions of urea [*R.A.M.*, xviii, p. 630] or glycine, which did not immediately affect the biological activity of the virus, as indicated by tests on *Phaseolus vulgaris*. The application of the Kuhn equation to the tobacco mosaic virus protein is considered to be demonstrably invalid [see preceding and next abstracts], inasmuch as the formula in question is based essentially on laminar streaming in conformity with the ideal laws of Stokes, Fick, and Poiseuille, which are, however, not obeyed in the present case. Evidence is briefly presented for the thixotropic character of the system made up of the virus protein in water.

FRAMPTON (V. L.). **On the molecular weight of the Tobacco-mosaic protein.**—*Phytopathology*, xxix, 6, pp. 495–497, 1939.

The author critically examines the basis on which the estimate of 17,000,000 (later corrected to 43,000,000) for the molecular weight of the tobacco mosaic virus protein is calculated. This basis was that Stokes's law is valid for the virus proteins, but recent information indicates that Fick's and Pouiselle's laws are inapplicable to sols of the protein in question and consequently that Stokes's law also is not followed [see preceding abstracts]. He concludes that the molecular weight of the protein is not definitely known.

PFANKUCH (E.) & KAUSCHE (G. A.). **Phosphatatische Inaktivierung von pflanzlichen Viren.** [Phosphatatic inactivation of plant viruses.]—*Biochem. Z.*, ccci, 3, pp. 223–224, 1939.

Virus preparations of tobacco mosaic and potato virus X, inoculated into *Datura stramonium* after 48 hours' treatment with phosphatase extracts from potato and beet, were found to be largely inactivated (average of 18 single lesions per half leaf as compared with 41 after treatment of the same duration with water).

Kausche (G. A.), Pfankuch (E.), & Ruska (H.). **Die Sichtbarmachung von pflanzlichem Virus im Übermikroskop.** [Rendering the plant virus visible in the ultramicroscope.]—*Naturwissenschaften*, xxvii, 18, pp. 292–299, 12 figs., 1 graph, 1939.

By a process involving the desiccation of the virus sol it is possible to secure homogeneous dried gelatinous preparations of the tobacco mosaic and potato X viruses [*R.A.M.*, xviii, p. 543] showing their structural organization. The use of reasonably high tobacco mosaic virus concentrations (10^{-5} gm. protein per c.c.) precludes the lateral aggregation of the sols into bands and facilitates the separate drying of each rod or thread. The dimensions of the smallest structures, computed by this method, were found to agree with the estimates obtained by X-ray and ultracentrifugation calculations. The bacillary and filiform elements falling within the ranges of 300 and 150 mμ, respectively, in length and 15 mμ in diameter are considered to represent the actual molecules of the tobacco mosaic virus, any multiples thereof being regarded as linear or lateral aggregations.

Ryjkoff (V. L.) & Smirnova (Mme V. A.). **Accumulation of virus of Tobacco mosaic in plants when nitrogen is withheld from them.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xxiii, 1, pp. 95–97, 1939.

The results of pot experiments in which nitrogen was withheld from tomato plants inoculated with tobacco mosaic showed that the titre of the virus in the juice of such plants is not lower than in those receiving a normal supply of nitrogen, and that the virus continues to accumulate at the expense of the 'sound' proteins of the plant [cf. *R.A.M.*, xiv, p. 474]. Diseased plants suffered much more from cutting off the nitrogen than healthy plants.

Johnson (J.). **Studies on the nature of brown root rot of Tobacco and other plants.**—*J. agric. Res.*, lviii, 11, pp. 843–863, 2 pl., 5 figs., 1939.

In studies in Wisconsin on the behaviour of the agent of brown root rot of tobacco [*R.A.M.*, vi, p. 3; xviii, p. 634] it was found that approximately three days' exposure of tobacco and tomato plants to brown root rot soil was necessary before the first symptoms became even faintly visible. When diseased soil was mixed with sterilized soil, it required 5 to 20 per cent. of infected soil to produce traces of the disease. At higher concentrations the amount of disease was roughly proportional to the percentage of brown root rot soil present. It was not possible to extract the agent of the disease from soil by leaching with water. The addition of fresh, diseased roots to a soil produced the diseased condition in the soil, but when filtered juice from such roots was added no disease developed. The disease agent was found to be intolerant of rapid air-drying of the soil but withstood prolonged slow drying. It was destroyed by the comparatively low temperature of 45° C. in 24 hours and by moderate freezing temperatures maintained for relatively long periods. Aeration and light had no effect on the pathogenic factor, which was eliminated from the soil by several germicides as well as by powdered charcoal, whereas other chemicals with similar properties were

ineffective. In tests of 100 plants grown in brown root rot soil the following were susceptible: tomato, cotton, cowpea, soy-bean, bean (*Phaseolus vulgaris*), vetch, potato, eggplant, chilli, lettuce, lucerne, and pigeon pea; a number of species were classed as resistant or immune. The use of certain susceptible crops, e.g., tobacco, in diseased soil rather strikingly diminishes the disease in subsequent years, due in great part to the exposure of cultivated soils to the influence of the weather.

Histological studies showed that one of the chief characteristics of brown root rot lesions is the sharp demarcation by the cell walls of the diseased areas from surrounding healthy tissue. Thickening of the cell walls occurs in the affected parts, and the nuclei disintegrate in the diseased cells. The lesions are often superficial but usually spread through the cortex of young roots, after which rapid and extensive spread may occur round the stele. The living cortex sloughs off from the diseased roots, leaving only the thread-like central cylinder. No organism was found constantly associated with the disease, though this evidence does not disprove the possibility that organisms on the exterior of the roots or in the soil may excrete toxins necrotically injurious to the roots. So far, however, the true nature of the causal agent is not known.

Spencer (E. L.) & Lavin (G. L.). **Frenching of Tobacco.**—*Phytopathology*, xxix, 6, pp. 502–503, 1939.

In spectrographic analyses at the Rockefeller Institute for Medical Research frenched tobacco plants [*R.A.M.*, xvii, p. 632] grown in field soil under greenhouse conditions gave negative reactions to the thallium test as did also those in sand cultures except where the mineral (as thallium nitrate) was added to the nutrient at a minimum concentration of 0·1 p.p.m. (sufficient to produce faint symptoms of frenching). It might thus be inferred that frenching and thallium toxicity are two distinct disorders, but in view of the similarity of the conditions, not only as regards symptoms but also in respect of control, it is more likely that the toxic action of the chemical alters the metabolism of the root, thereby giving indirect rise to some disturbance involving the top. Thallium may also occur in the soil in the form of a complex compound less readily translocated to the aerial portions of the plant than the pure salts used in the experiments. If this hypothesis be accepted, the spectrographic detection of thallium only in those plants treated with thallium nitrate would not necessarily eliminate the mineral as a possible cause of frenching.

Middleton (J. T.). **Infection of Tomato and Red Clover with conidia of Pleospora lycopersici and Macrosporium sarcinaeforme.**—*Phytopathology*, xxix, 6, pp. 541–545, 2 figs., 1939.

In inoculation experiments at the Division of Plant Pathology, University of California, aqueous suspensions of the conidia of *Pleospora lycopersici* were found to be capable of infecting Dwarf Champion, San José Canner, Earliana, and Stone tomato [*R.A.M.*, xiv, p. 799] leaves and flowers, but gave negative results on red, white, and white sweet clovers (*Trifolium pratense*, *T. repens*, and *Melilotus alba*) and lucerne; these legumes were susceptible, on the other hand, to *Macrosporium*

[*Stemphylium*] *sarcinaeforme* [ibid., xviii, p. 141], which is non-pathogenic to tomato. Cultural dissimilarities and pathogenic differences between *S. sarcinaeforme* and *P. lycopersici* are considered to preclude the application of the former binomial to the imperfect stage of the latter [ibid., i, p. 63].

Takimoto (S.). **Bacterial plant diseases in Japan. VII. Studies on the bacterial spot of Tomato.**—*Ann. phytopath. Soc. Japan*, ix, 1, pp. 22–32, 3 figs., 1939. [Japanese, with English summary.]

The causal organism of a destructive tomato disease, involving the leaves, pedicels, peduncles, stems, and fruits (with seeds) and causing heavy losses in Chosen, Japan, was found to be practically identical with *Bacterium vesicatorium* [*R.A.M.*, xviii, p. 421]. Infection takes place through the stomata and injured tissues, rarely by way of unwounded fruits. The bacterium overwinters in the soil and on diseased plant refuse. Good control may be obtained by seed treatment with 1 in 1,000 to 1 in 3,000 mercuric chloride, followed by two to three applications of 3–2–75 or 3–2–90 Bordeaux mixture prior to the appearance of the first symptoms.

True (R. P.) & Slowata (S.). **Scouting and sampling Elms with symptoms commonly associated with the Dutch Elm disease as an aid in eradicating Ceratostomella ulmi.**—*Phytopathology*, xxix, 6, pp. 529–537, 1 graph, 1939.

Fortnightly inspections of 2,239 elm trees in 1936 and of 4,424 in 1937 in New Jersey indicated that, with the advance of summer, the prevalence of the symptoms associated with *Ceratostomella ulmi* [*R.A.M.*, xviii, p. 641] increased markedly until the onset of defoliation in the middle of September. The efficiency of symptom sampling reached a maximum during the latter part of June and throughout July. Internal discoloration was associated with the external symptoms in $\frac{1}{3}$ to $\frac{1}{2}$ of the trees sampled, i.e., 3 to 10 per cent. of the total trees observed. Relatively low percentages of the specimens collected from trees showing both internal and external symptoms yielded *C. ulmi* on culturing. In one carefully inspected and sampled plot series in an area where the disease was prevalent, twelve trees, showing no symptoms before 1st September in either year, revealed infection on close examination on the felling of the 419 remaining trees.

Ferdinandsen (C.) & Jørgensen (C. A.). **Skovtræernes sygdomme. Anden Halvdel.** [Forest tree diseases. Second half.]—pp. vii xi, 287–570, 95 figs., Copenhagen, Gyldendalske Boghandel, 1939. Complete Kr. 25·50 (bound Kr. 31·50).

This second part of the authors' comprehensive treatise on forest tree diseases in Denmark [*R.A.M.*, xviii, p. 212] completes the systematic account of the Thelephoraceae (14 pp.), Hymenomycetes including Polyporaceae [ibid., xviii, p. 215], and Agaricaceae, and then deals with blue-staining organisms, diseases in tree nurseries, mycorrhiza, alder nodules (*Actinomyces alni*) [ibid., xviii, p. 335], and bacterial diseases. The work is furnished with keys for the determination of the various organisms on their several hosts, a 21-page bibliography, and an index of Danish and Latin names.

Herrick (J. A.). **Growth and variability of Stereum gausapatum in culture.**—*Phytopathology*, xxix, 6, pp. 504–511, 3 figs., 1939.

In an intensive two-year study at the Kent State University, Ohio, of the development on potato dextrose agar at 25° C. of twelve selected isolates out of a total of 58 of *Stereum gausapatum* from the rotted heart wood of oaks in various parts of the north-eastern United States [*R.A.M.*, xvi, p. 505], wide variations were consistently observed in the growth rate and mycelial characters of the different cultures. In one isolate a depressed zone developed round the site of inoculation. Other cultures remained cottony and nearly white instead of assuming a dark coloration and becoming consolidated into tough mats. Again, the mycelia of certain strains were conspicuous by their rich orange colour and concentric zonation, and one showed also a dense, abrupt margin of the advancing mycelium. Only one strain progressed in the accepted normal manner as a submerged mycelium.

Jenkins (Anna E.). **New species of Taphrina on Red Maple and on Silver Maple.**—*J. Wash. Acad. Sci.*, xx, 5, pp. 222–230, 4 figs., 1939.

English and Latin diagnoses are given of two new species of *Taphrina*, namely, *T. dearnessii* on red maple (*Acer rubrum*) and *T. carveri* on silver maple (*A. saccharinum*) [cf. *R.A.M.*, xviii, p. 355], both originally collected by J. Dearness in Ontario in 1890 and subsequently found by G. W. Carver and other mycologists in different parts of the United States. The circular or angular spots produced by *T. dearnessii*, often of a bistre- to blackish-brown colour with cinnamon centres on dry specimens, sometimes causing rugosity of young foliage, may be situated on any part of the red maple leaf, though they are commonly marginal or distributed along the main veins; the affected samarae are partially or entirely discoloured and covered with cylindrical to slightly clavate asci (which may also be hypo-, rarely epiphyllous), rounded or truncate at the apex, 17 to 29 by 8 to 13 μ (frequently 21 to 29 by 10 to 11 μ), the stalk cell rounded, flattened, or slightly pointed at the base, occasionally moderately lobed, 6 to 12 by 10 to 18 μ, containing eight globose to elliptical spores, 2·8 to 5·6 by 3 to 3·5 μ.

The rugose, circular, elliptical, or irregular spots, up to 3 by 1 cm. in diameter, of *T. carveri*, of which 25 or more may occur on a single leaf of *A. saccharinum*, range in colour in herbarium specimens from sepia on the upper surface through isabella and light brownish-olive on the lower to blackish-brown on both sides; the amphigenous or more commonly hypophyllous, cylindrical asci, with rounded or truncate apex, measure 23 to 35 by 7·8 to 16·8 μ (often 26 to 30 by 9 to 15 μ), with a rounded, flattened, or irregular stalk cell, sometimes slightly pointed at the base, occasionally moderately lobed, 4 to 15 by 10 to 22 μ, containing eight subglobose or elliptical ascospores, 4 to 7 μ in diameter, and budded conidia, spherical or oblong-elliptical, the latter up to 7 by 3 μ.

Hemmi (T.) & Ikeya (J.). **Studies on Lenzites gibbosa (Pers.) Hemmi n. comb. causing wood-rot of deciduous trees.**—*Ann. phytopath. Soc. Japan*, ix, 1, pp. 1–15, 2 pl., 1939. [Japanese, with English summary.]

A detailed account is given of taxonomic and morphological studies

on *Trametes gibbosa*, a widespread agent of white, spongy decay among broad-leaved trees [*R.A.M.*, ix, p. 499] throughout Japan. The shape of the tube orifices is strikingly variable, not only on different sporophores but on various parts of the same one, the lamellate form showing more extensive development than the trametoid. The fungus is therefore transferred to the genus *Lenzites* as *L. gibbosa*. The optimum temperature for mycelial growth on apricot and potato decoction and soy agars was just above 28° C.

KAWAI (I.). **On the intracellular bodies associated with the dwarf disease of Mulberry trees.**—*Ann. phytopath. Soc. Japan*, ix, 1, pp. 16–21, 4 figs., 1939. [Japanese, with English summary.]

Oval, round, or occasionally irregular, multivacuolate intracellular bodies, 4·5 to 13·5 by 4·5 to 6 μ, have been found closely associated with the nuclei of the epidermal or mesophyll cells of the leaves of mulberry trees affected by dwarf disease in Japan [*R.A.M.*, xi, p. 756]. The detection of these elements is considered to place the virus origin of the disorder [cf. ibid., xvii, p. 538] beyond a doubt.

FRON [G.] & NÈGRE (A.). **Sur une maladie du Micocoulier.** [On a disease of the Nettle Tree.]—*C.R. Acad. Agric. Fr.*, xxv, 20, pp. 691–693, 1939.

Attention is drawn to a disease of the nettle tree (*Celtis australis*) in the Nîmes district of France, where it is very popular for planting in avenues and the like and largely used to replace elms destroyed by *Graphium* [*Ceratostomella*] *ulmi*. The disorder is characterized by stunting, malformation, brown spotting, and premature shedding of the leaves. The primary cause of the trouble is still obscure, the development on the affected foliage of *Exoascus* [*Taphrina*] *celtidis* being insufficiently active to account for the symptoms, while the attacks of a Microlepidopterous insect, *Lithocollethis millierana*, also appear to be secondary.

HEPTING (G. H.) & TOOLE (E. R.). **The Hemlock rust caused by Melampsora farlowii.**—*Phytopathology*, xxix, 6, pp. 463–473, 2 figs., 1939.

Up to 82 per cent. of the 1938 shoots of eastern hemlock (*Tsuga canadensis*) were destroyed in nurseries in western North Carolina by *Melampsora farlowii*, which also, as reported in 1935 [*R.A.M.*, xv, p. 331], attacks the Carolina hemlock (*T. caroliniana*) to a much slighter extent. The rust, which also infects the leaves and cones, is widespread in the eastern United States and Canada, appreciable damage being caused, however, only under conditions promoting dense foliar growth, e.g., in nurseries, hedges, and the like. The disease is not restricted to small trees or the lower parts of large ones, profuse twig and cone infection having been observed in 1938 in the tops of two trees, 80 and 45 ft. in height.

Spring inoculum is supplied by the teleutosori on the over-wintered twigs and cones killed during the previous spring. In western North Carolina sporidial production, which must apparently be preceded by at least ten hours' rain, usually extends from early May to mid-June, coinciding with the most active period of shoot development. Twig infection apparently occurs through the needles.

The best control of *M. farlowii* in nursery experiments was given by weekly applications throughout May of lime-sulphur (4 lb. dry in 50 gals.) plus casein spreader (2 lb. in 50 gals.), only 3 per cent. of the twigs on the treated trees being killed as against 19 per cent. on the unsprayed. The average cost of the treatment was 0·4 cents per tree per application.

Karakoulin (B. P.). К вопросу о методах испытания антисептиков, употребляемых при борьбе с домовыми грибами. [On the methods of testing antiseptics used in the control of house fungi.]—*Sovetsk. Bot., 1939*, 2, pp. 57–65, 1939.

The author tested anthracene oil and carbolineum in the control of *Merulius lacrymans* and *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xviii, p. 644] by a method previously outlined by other workers [ibid., xiii, p. 70], in which the value of the antiseptic was estimated by the growth intensity of the test fungus on wood sections saturated with it and placed in Erlenmeyer flasks containing cultures of the fungus on garden soil and wood. The oils used were diluted with benzol. The growth of both fungi was completely arrested by doses of anthracene oil of between 1 and 2 per cent. (of the weight of the wood) while the 5 per cent. carbolineum (the largest concentration used) only retarded it slightly.

Olsson (P. A.). **Svalöfs Majrova. En Rovsort, speciellt för odlingsområden där klumprotsjukan härjar.** [Svalöf's May Turnip. A Turnip variety specially adapted for cultivation areas where club root is destructive.]—*Sverig. Utsädesfören. Tidskr.*, xlviii, 6, pp. 471–476, 1 fig., 1939.

Details are given of the trials carried out at Svalöf, Sweden, from 1936 to 1938 with several turnip varieties, among which the round, white-fleshed May (especially strain J013) proved outstanding in resistance to club root (*Plasmodiophora brassicae*) [*R.A.M.*, xii, p. 670]. Dale's Hybrid also showed a certain amount of resistance, but the only other variety approaching May in this respect was Weibull's Immuna.

Schille (H.). **Erddämpfung und Schwarzbeinigkeit.** [Soil steaming and black leg.]—*Obst- u. Gemüseb.*, lxxxv, 6, p. 71, 2 figs., 1939.

Black leg of cabbage (*Olpidium brassicae* [*R.A.M.*, xviii, p. 483], *Moniliopsis aderholdi* [ibid., xvii, p. 183], and *Pythium de Baryanum*) is stated to be responsible for losses of 30 per cent. or more of the crop in the Bonn district of Germany, where excellent control is given by steam sterilization of the soil.

Eschkilsen (L. W.). **Dusting and spraying Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., East. Div., 1939*, pp. 16–20, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 8, p. 34, 1939.]

During the period from 16th July to 2nd September, [? 1938], a mobile dusting outfit consisting of two Bean power dusters mounted on small trucks moved from farm to farm under the auspices of the Great Lakes Sugar Company to conduct operations against beet leaf spot (*Cercospora*) [*beticola*: *R.A.M.*, xviii, p. 566]. The mixture used consisted of lime and copper sulphate (4:1), applied at the rate of about 40 lb. per acre at each dusting, the work being carried on at night. The

area covered by the two machines in a ten-hour shift ranged from 86 to 157 acres.

To cite an example of the results, in a field of 16·44 acres dusted on 9th and 22nd August and 2nd September, the treated beets yielded 14·23 net tons per acre as against 11·76 for the untreated, the sugar contents being 17·8 and 16·1 per cent., respectively, and the sugar production per acre approximately 4,817 and 3,539 lb., respectively. The colour of the dusted leaves rapidly changed from pale to dark green following the application of the mixture. Allowing 50 to 60 cents per acre for the soil improvement value of the lime used, the cost of the three anti-leaf spot treatments was just over $4, which may be regarded as a reasonable insurance against yield reduction.

Calland (J. W.). **Dusting Sugar Beets in the Decatur Territory, 1939.**—*Proc. Amer. Soc. Sug. Beet Technol., East. Div., 1939*, pp. 20–23, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 8, p. 34, 1939.]

Two Bean self-mixing power dusters, equipped to dust twelve rows at a time, applied a Bordeaux dust consisting of 12½ lb. monohydrated copper sulphate and 50 lb. hydrated lime to sugar beets [for the control of *Cercospora beticola*: see preceding abstract] in the Decatur Territory at the rate of 30 to 35 lb. per acre at 10- to 14-day intervals between 19th July and 30th August, followed by a fourth treatment in six fields during the first week in September. The outfit dusted an average of 60 acres in a ten-hour day, the cost per acre of one treatment being reckoned at $1·30. No difference in the results was observed between day and night applications. The average acre yields of the 580 acres treated three times were 7·32 and 6·42 tons for the treated and untreated beets, respectively, the corresponding figures for sugar content being 16·85 and 15·45 per cent. and sugar production per acre 2,269 and 1,825 lb., respectively. It is estimated that the 444 lb. gain in recoverable sugar, together with the extra pulp, would represent a value to the farmer of $8·34 at present prices. By 1st August, according to local observations, it should be possible to forecast with fair accuracy the probable extent of leaf spot damage in a given year.

Bronner (G.). **Zur Bekämpfung der Blattfleckenkrankheit bei Zuckerrüben. Sechs Jahre praktische Erfahrungen in Oberösterreich.** [On the control of Sugar Beet leaf spot disease. Six years' practical experience in Upper Austria.]—*Dtsch. landw. Pr.*, lxvi, 19, pp. 237–238; 20, pp. 247–248, 7 figs., 1939.

Details are given of the writer's six-year campaign against leaf spot of sugar beets (*Cercospora beticola*) in the fields supplying the Enns sugar factory, Linz, Upper Austria [*R.A.M.*, xviii, p. 566]. In preliminary trials in 1934, four applications of Bordeaux mixture resulted in an average yield increase of 35 doppelzentner [3,500 kg.] per hect. In 1935 comparative spraying and dusting experiments were carried out, the former with 40 per cent. copper oxychloride and the latter with 10 per cent. cuprispora Mantov [ibid., xvi, p. 362]; in the two following years dusts from the firms of Skoda-Wetzler and Bayer were also used with good results. Five fortnightly dry and four liquid treatments at 20-day intervals were given. In 1937 only 2 per cent. of the total area

was treated with dusts owing to the various inconveniences of the method, and in 1938 it was discontinued in favour of the cheaper and more uniformly reliable spraying, the total cost of which is estimated at RM. 48 per hect. The average reduction in the yield of roots due to *C. beticola* from 1932 to 1937, inclusive, was 4,000 kg. per hect., valued at RM. 140, the corresponding figure for the foliage being RM. 50. Taking the cost of the treatment as equivalent to the value of 1,400 kg. beets, it is evidently more than repaid by the augmented production. In 1937, moreover, when 87 per cent. of the area under beets was sprayed, the sugar content was 5,200 kg. per hect. compared with 3,400 in 1932, a season of similar climatic conditions when no treatments were applied. Until it is possible to develop an immune variety adapted to the Upper Danube valley the spraying campaign must be continued without relaxation: for 1939 the area registered for treatment amounted to 96 per cent. of the total.

Nelson (R.). **Tests for new dust and liquid fungicides in 1938 for control of Celery leaf blights.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxi, 4, pp. 295–307, 1939.

In further comparative dusting tests in Michigan against early and late blight of celery (*Cercospora apii* and *Septoria apii-graveolentis*) [*R.A.M.*, xvii, p. 722; xviii, p. 291] the best results obtained in experiments on three farms at Comstock were given by cuprocide No. 1 (7 lb. cuprocide, 30 lb. sulphur, and 63 lb. talc), which reduced the number of blight spots per leaflet from an average of 21·4 to one of 7·7 in the first experiment (9 applications), from 37 to 6·4 in the second (16) and 44·8 to 7·2 in the third (10).

The cuprocide dusts were superior to the others in flowing qualities, and the uniform discharge and maximum dispersion of the particles gave a degree of coverage not attained with any dust previously tested. The adhesiveness but not the fungicidal effectiveness of the dusts was increased by the use of stickers. Basicop-sulphur-talc and Bordow-sulphur-talc were less satisfactory, being about as effective as the monohydrated copper sulphate-hydrated lime (20–80) and copper sulphate-lime-talc mixtures.

In a comparative test with Bordeaux mixture 8–12–100 and 8–6–100 and various copper sprays, the former gave the best results, reducing infection from an average of 76·89 spots per leaflet to 1·38 and 1·90, respectively, without causing perceptible injury. Local growers who use liquid fungicides are again advised to rely on standard 8–12–100 Bordeaux mixture for the control of celery leaf blights.

Morris (L. L.) & Platenius (H.). **Low temperature injury to certain vegetables after harvest.**—*Proc. Amer. Soc. hort. Sci.*, xxxvi, pp. 609–613, 3 figs., 1939.

The low temperature injury of cucumbers known as pitting is characterized by the formation of numerous circular pits, 3 to 10 mm. in diameter and less than 1 mm. deep, which may combine to form large, irregular, sunken areas. Experiments are described which showed that pitting occurred on cucumbers stored at all temperatures between 33° and 60° F., but that, other factors remaining constant, injury became

progressively less severe as the storage temperature was raised. The relative humidity of the storage room exerted a marked effect on rate of pitting at any one temperature, severity being inversely proportional to relative humidity. Thus, at 32° to 36° and relative humidities of 50 to 54, 70 to 75, and 90 to 100 per cent., pitting after nine days was, respectively, severe, moderate, and very slight. At all temperatures from 39° to 61° no pitting developed after seven days at relative humidities of 95 to 100 per cent. At 39° to 42° pitting was severe at 50 to 60 per cent. humidity and moderate at 79 to 88; at 49° to 50° it was moderate at 50 to 55 per cent. and absent at 81 to 90; and at 60° to 61° it was very slight at 50 to 60 per cent. and absent at 81 to 90.

Almost identical results were obtained with California Wonder peppers [*Capsicum annuum*]. Low temperature injury was also produced on eggplants, watermelons, summer and winter squashes, pumpkins, snap beans [*Phaseolus vulgaris*], and celery held at an average temperature of 35° in low relative humidity.

Typical pitting was produced in cucumbers stored even at 70° when kept for one week in a closed container in which the atmosphere was replaced twice daily by the introduction of pure nitrogen. The evidence obtained indicated that the final stage of low temperature breakdown in cucumbers is a localized desiccation near the epidermis.

Bailey (R. M.). **Progress in breeding Cucumbers resistant to scab (Cladosporium cucumerinum).**—*Proc. Amer. Soc. hort. Sci.*, xxxvi, pp. 645–646, 1939.

Data obtained in further work in Maine on breeding cucumbers for resistance to *Cladosporium cucumerinum* [*R.A.M.*, xviii, p. 651] supported the view that monogenic inheritance is involved in major resistance in inbred lines and crosses. The degree of resistance varied slightly in crosses, indicating that it may perhaps be influenced by secondary factors. Resistance appeared to be incompletely dominant to susceptibility.

Eighteen cultures of the fungus were made from an equal number of diseased fruits found in widely separated localities in Maine, and seedlings of resistant inbreds and susceptible varieties were inoculated with each strain. One was found to be non-pathogenic, but no significant difference in pathogenicity was shown by the remainder. That troublesome physiologic strains of the fungus are not present in New England was further indicated by growers of Maine No. 2 cucumber, a selection recently released for home garden use. Of 55 reports on this variety, 46 stated it showed no scab, eight a trace, and one (under further investigation) reported considerable infection, while of 41 reports on other varieties by the same growers only eight showed no scab.

The evidence indicated that resistance is either independent of, or so loosely associated with, spine and fruit colour, and shape and size of fruit, as not to cause any serious interference with practical breeding.

Sarazin (A.). **Cultures monospermes d'Agaricus campestris var. cultivée.** [Monospore cultures of the cultivated variety of *Agaricus campestris*.]—*C.R. Acad. Sci., Paris*, ccviii, 25, pp. 2015–2017, 3 figs., 1939.

Monospore cultures of *Agaricus* [*Psalliota*] *campestris* were obtained

by selecting from a germinating spore layer single individuals with incipient germ-tubes and transferring them separately with a de Fonbrune micromanipulator to Van Tieghem cells. The most vigorous of these cultures produced carpophores a week earlier than the mass controls, and the mature mushrooms were found to have reverted to the original growth habit of the variety, viz., a broad, spreading cap and squat stipe, features that had been quite lost in the ordinary methods of cultivation.

Bernon (G.). **Recherches sur la coulure.** [Investigations on 'coulure']. —*Progr. agric. vitic.*, cxi, 11, pp. 247–254, 3 figs., 2 graphs, 1939.

The results of studies briefly reported in this paper are considered to indicate that in the French vine variety Clairette, highly susceptible to 'coulure' [*R.A.M.*, x, p. 640], the malady is mainly due to low vitality of the pollen, associated with too vigorous growth of the vegetative organs. The trouble may be controlled by making annular incisions at the base of the fruiting shoots, removing the growing points, and applying to the flowers pollen from other varieties.

England and Wales : new and interesting phytopathological records for the year 1938.—*Int. Bull. Pl. Prot.*, xiii, 7, pp. 153M–154M, 1939.

Fungi recorded in England and Wales for the first time in 1938 included *Oidium begoniae* [*R.A.M.*, xvi, p. 299] on the lower leaves of begonias under glass, *Haplobasidium pavoninum* causing leaf blotch of a seedling *Aquilegia*, and *Sclerotinia bulborum* [ibid., v, p. 14] on L'Innocence hyacinth bulbs grown in Lincolnshire and on a single imported hyacinth bulb, while the following constitute new host records: *Armillaria mellea* on carrot and lavender, *Sclerotium tuliparum* [ibid., xvii, p. 531] on crocus, *Thielaviopsis basicola* on *Daphne mezereum* and scabious [*Scabiosa*], and *Ustilago vaillantii* on *Muscari botryoides* and *Scilla verna*.

Conners (I. L.). **Eighteenth Annual Report of the Canadian Plant Disease Survey, 1938.**—xii+112 pp., 1939. [Mimeographed.]

During 1938, wheat stem rust (*Puccinia graminis*) proved destructive in Manitoba, eastern Saskatchewan, the maritime provinces of Canada, and Quebec [cf. *R.A.M.*, xvii, p. 796]. Only about 14 per cent. of the wheat acreage in Manitoba was sown to susceptible varieties and the resistant Renown and Thatcher showed only slight traces of rust.

Wheat leaf rust (*P. triticina*) was exceptionally prevalent in western Canada, Thatcher being the most severely attacked commercial variety. Renown was less heavily infected, while Marquis, Reward, and Ceres were intermediate. The disease considerably reduced the yield of all varieties (35 or more per cent. in the case of Thatcher in some areas).

Crown rust of oats (*P. coronata*) was prevalent in eastern Saskatchewan and Manitoba, and in most of eastern Canada, though less destructive than in 1937. Further evidence was secured that buckthorn (*Rhamnus cathartica*) plantings are responsible for serious outbreaks. Crown rust apparently possesses greater powers of spread than stem rust and a few *R. cathartica* bushes suitably situated may set up an epidemic of *P. coronata* over a relatively large area.

Botrytis cinerea was isolated from oat head blight in Nova Scotia and New Brunswick, apparently the first record on oats. *Fusarium graminearum* [*Gibberella saubinetii*] (a species seldom found in Canada) was isolated from head blight of wheat in the maritime provinces.

Ergot (*Claviceps purpurea*) became a problem in wild rice (*Zizania aquatica*) in northern Manitoba, where the crop, owing to its failure in Minnesota, was of considerable commercial value.

Leaf spot (*Stemphylium sarcinaeforme*) [ibid., xviii, p. 141] occurred on red clover (*Trifolium pratense*) at Macdonald College, Quebec, the first record of this fungus for Canada, though it is commonly found in New York State.

Potato bacterial wilt and rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*: ibid., xviii, p. 612] was destructive in Quebec and was found in an even larger number of fields in New Brunswick. It was noted for the first time (in one or a few fields) in Alberta, Saskatchewan, Manitoba, Ontario, and Prince Edward Island. The smear method proved very useful in showing the presence of the organism in suspected tubers, and it is expected that the use of this method will expedite the elimination of diseased stocks.

Purple top wilt [ibid., xvii, p. 700] widely affects potatoes in the prairie provinces, but seldom causes more than a trace of damage.

Vegetable diseases noted included bacterial blight of carrot (*Phytomonas* [*Pseudomonas*] *carotae*) [ibid., xiv, p. 211], first observed in 1935, and found in 1938 at Brandon and near Winnipeg. Bacterial blight (*Phytomonas* [*Bact.*] *phaseoli*) [ibid., xvii, p. 369] caused an estimated loss of $50,000 in the bean [*Phaseolus vulgaris*] crop in the irrigated areas of southern Alberta. In the Niagara Peninsula, Ontario, *Phomopsis vexans* [ibid., xviii, p. 370] was destructive to eggplants. Radishes in Quebec were affected by black root (*Aphanomyces raphani*) [ibid., xv, p. 420], a new record for Canada. Anthracnose (*Colletotrichum phomoides*) [ibid., xvi, p. 419], not infrequent on imported tomatoes, was epidemic in Essex and Kent counties, Ontario, greatly reducing the quantity of marketable fruit.

Apple fireblight (*Erwinia amylovora*), locally destructive in 1938 in most parts of Canada, has never been reported from Alberta or the famous commercial orchards of the Annapolis valley, Nova Scotia, but some damage was caused to nursery stock in the latter province by what appeared to be this disease. Drought spot or corky core [internal cork: ibid., xvii, p. 465; xviii, p. 117] is not now a problem in orchards given soil treatments with boric acid in British Columbia, where applications made in 1936 were still fully effective in 1938.

Picea rubra at St. Martins, New Brunswick, was affected by needle rust (*Chrysomyxa weirii*), apparently the first record of this rust in eastern Canada.

New diseases of ornamental plants and important extensions of range or host included bacterial leaf spot of greenhouse carnations in Ontario due to *Phytomonas* [*Bact.*] *woodsii* [ibid., xvii, p. 728], a new record for Canada. Corm rot (*F. oxysporum* var. *gladioli*) [ibid., xvi, p. 335] affected gladiolus at Winnipeg, a new disease on this host in Canada. Iris at Summerland, British Columbia, was affected by *Botrytis* rhizome rot (*Sclerotinia convoluta*) [ibid., xvi, p. 751]; the only previous record of

this disease in Canada was in 1927. Powdery mildew (*Microsphaera alni*) [ibid., xvii, p. 754] was found on privet, a new host for this fungus, in Ontario and Prince Edward Island. Bacterial blight (*Phytomonas* [*Bacterium*] *papavericola*) [ibid., ix, p. 456] was recorded in British Columbia on Tibetan poppy (*Meconopsis baileyi*), a new host for the organism, and a new disease for Canada. *Phytophthora cactorum* caused tulip blossom blight in Ontario, and dark berry of *Cotoneaster horizontalis* on Vancouver Island. Crown rot (*Phytomonas* [*Bact.*] *delphinii*) was found on a new host, *Aconitum*, in Manitoba.

[A survey of the new or noteworthy diseases (pp. ii–vi) is given in *Int. Bull. Pl. Prot.*, xiii, 9, pp. 201–204, 1939.]

Brien (R. M.). **A list of plant diseases recorded in New Zealand.**—*Bull. N.Z. Dep. sci. industr. Res.* 67, 39 pp., 1939.

This is a list, arranged alphabetically under the botanical names of the hosts, of 411 plant diseases recorded, for the most part since 1920 and some for the first time, in New Zealand. Literature references and an index of pathogens and physiological diseases are appended. Among new records the following may be mentioned: *Botrytis allii* [*R.A.M.*, xviii, p. 43] on, and yellow dwarf (*Allium* virus 1 of Smith) [cf. ibid., xvii, p. 576] of, onion, mosaic (*Cucumis* virus 1) of cantaloupe, vegetable marrow, and cucumber, *Entyloma dahliae* on cultivated dahlia [ibid., xvii, p. 752], *Sclerotium* [*Sclerotinia*] *gladioli* [see above, p. 712] on cultivated *Gladiolus*, *Phoma destructiva* and *Phytophthora cryptogea* on tomato, and *Botrytis tulipae* on, and break (*Tulipa* virus 1) of, cultivated tulips.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 7, pp. 367–371, 4 figs., 1939.

Fusarium wilt of tomatoes [*F. bulbigenum* var. *lycopersici*: *R.A.M.*, xviii, p. 557] would be a serious disease in New South Wales but for the resistance shown by most of the commercially grown varieties. Under ordinary field conditions, Red Marhio, Break O'Day, Marglobe, and Australian Earliana are highly resistant. The chief heated-glasshouse variety, Planter's Favourite, is also resistant, while Potentate, Rutgers, and Antibes are promising new varieties showing resistance. Bonny Best, strains of Earliana other than Australian Earliana, and the Chinese types grown in unheated greenhouses are very susceptible.

Owing to exceptionally humid weather, unusually large numbers of navel oranges and other citrus fruits in coastal orchards in New South Wales became infected by green and blue moulds (*Penicillium digitatum* and *P. italicum*, respectively). The chief avenue of infection was found to be minute punctures made by fruit flies when depositing eggs in the rind. Although fruit-fly eggs laid in green orange fruits seldom develop any further, the presence of the stings alone was enough to aid infection under the climatic conditions prevailing.

Cuprinol gave very satisfactory results in preventing mould decay (due to *Cladosporium*, *Stemphylium*, *Alternaria*, *Aspergillus*, *Penicillium*, *Torula*, and other fungi) in linen and cotton fabrics, trebling the life of tent-fly canvas. The cloth is rolled into a small bundle and immersed for about one minute in undiluted cuprinol. The bundle is then

removed, allowing surplus liquid to drain back into the container, and is finally spread out to dry for two or three days.

STOREY (H. H.). **Plant pathology.**—*Rep. E. Afr. agric. Res. Sta., 1938*, pp. 13–19, 1939.

In this report [cf. *R.A.M.*, xviii, p. 373] the results so far obtained in the author's study on the mechanism of transmission of streak disease of maize by *Cicadulina mbila* are summed up on the basis of papers already published [ibid., xviii, p. 245] or pending publication, and the scope of further research is indicated. Several inbred lines of maize, selected from the Peruvian Yellow Flint and Hickory King varieties and tested at Amani under controlled infection by *C. mbila*, showed a high resistance to the streak virus and are expected, although poor producers themselves, to provide valuable material for breeding work.

In connexion with the breeding of cassava strains for resistance to mosaic [ibid., xviii, p. 574], a number of promising hybrids from crosses between cassava and either Ceara rubber [*Manihot glaziovii*] or *M. dichotoma* and from some 300 crosses between the more resistant cassava varieties have been multiplied at Amani and encouraging results have so far been obtained with inter-specific hybrids.

An investigation of a suspected virus disease of passion fruit in Kenya, stated to resemble in its typical form the 'woodiness' disease in Australia [ibid., xvii, p. 730], led to the conclusion that there are several forms of the disease, some of which have not yet been transmitted to healthy plants, while in one form the presence of a virus was demonstrated by successful transmission through juice transfer and through the use of a contaminated pruning knife. It is suggested that the most hopeful line of work would be the selection of a resistant strain either within the species, *Passiflora edulis*, or, more probably, among inter-specific hybrids.

Fifty-first Annual Report of the Rhode Island State College Experiment Station.—64 pp., 1939.

In this report on plant disease work on Rhode Island in 1937–8 [cf. *R.A.M.*, xviii, p. 442] it is stated that when Baldwin and McIntosh apple leaves were immersed for identical periods at different times from 7 a.m. to 7 p.m. in lime-sulphur (1 in 50), lead arsenate, and hydrated lime, singly and in different combinations, with most of the sprays, but especially lime-sulphur, burning became progressively greater with increasing lateness of treatment up to 1 p.m., after which it declined, reaching a minimum at 7 p.m. [cf. ibid., xviii, p. 686].

Rhode Island Greening apples picked on 1st, 9th, 16th, 23rd, and 30th September, when examined in March showed, respectively, 11, 64, 71, 55, and 55 per cent. free from scald, the corresponding figures for smaller fruits from 35-year-old trees in another orchard being 89, 96, 100, 100, and 100 per cent. Cortland apples from the former orchard picked on 16th, 23rd, and 30th September, and 7th and 14th October showed, respectively, 5, 21, 83, 93, and 100 per cent. freedom from scald. There would appear to be a definite relationship between the development of scald and time of picking.

Cabbages in soil where this crop had previously been affected by

club root [*Plasmodiophora brassicae*: ibid., xviii, p. 443] showed only 4 per cent. infection following soil treatment with chloropicrin, as against 45 per cent. for those in the untreated soil.

Bonnie Best tomatoes treated against *Phytophthora infestans* and *Alternaria solani* with seven applications of cuprocide-celite dust (one part cuprocide, seven parts celite, one part wheat flour, and one part calcium arsenate by weight) and eight applications of Bordeaux mixture (4–4–50) gave yields of 456 and 383 bush. per acre, respectively, as against 236 bush. per acre for the untreated control, the corresponding figures for the Rutgers variety being 438, 489, and 290 bush. per acre.

In a varietal resistance trial against *Peronospora schleideniana* [ibid., xiv, p. 647] the onion varieties Italian Red Bottle, White Sweet Spanish, Riverside Sweet Spanish, Grano, and Early Sweet Spanish showed, respectively, 95, 75, 60, 50, 10, and 5 per cent. uninjured leaves.

When Cobbler and Green Mountain potatoes were sprayed against late blight [*Phytophthora infestans*] four times with various Bordeaux mixtures the best result was given by Bordeaux mixture (8–8–50) with only 24 and 1 per cent. infection for the two varieties, respectively, as against 100 and 64 per cent. infection for the unsprayed controls.

Schoorel (A. F.). **Beknopt overzicht van de Rubber- en Theecultuur in het rayon Sokaboemi gedurende 1938.** [A concise report on Rubber and Tea cultivation in the Sokaboemi district during 1938.]—*Bergcultures*, xiii, 22, pp. 739–740, 1939.

The red and white root rots [*Ganoderma pseudoferreum* and *Fomes lignosus*: *R.A.M.*, xviii, p. 579] of rubber [*Hevea brasiliensis*] in the Sokaboemi district of West Java were well controlled by the routine method of trenching, though new cases developed in proximity to tea and *Albizzia falcata*. The roots of *Centrosema pubescens* in an infected trench were found to be free from red rot.

Of the various fungi observed in tea plantations *G. pseudoferreum* [loc. cit.] is stated to be virulent locally. Diseased *A. falcata* roots constitute the main source of recurrence of infection by *G. pseudoferreum*, and should be removed from a radius of 10 m. round the trenches. The incidence of grey blight (*Pestalozzia*) [*theae*] is stated to be steadily increasing, especially on chemically poor, weathered, red laterite soils.

Heubel (G. A.). **Beknopt overzicht van de ondernemingscultures in het rayon Zuid-Sumatra gedurende 1938.** [A concise report on the plantation crops in the south Sumatra area during 1938.]—*Bergcultures*, xiii, 23, pp. 768–782, 2 graphs, 1939.

White root rot [*Fomes lignosus*] is the only disease of importance in rubber [*Hevea brasiliensis*] plantations on sandy white soils in south Sumatra, where the same parasite also occurs on impermeable clay soils, sometimes in conjunction with red rot [*Ganoderma pseudoferreum*: see preceding abstract]. Brown root rot [*F. noxius*] appears to be present only in volcanic soils [ibid., xviii, p. 137]. Discussing the control of these root rots (by the usual methods of root exposure and encirclement of the diseased and adjacent trees by trenches), the writer

mentions that in a clearing on volcanic soil the thick lateral rubber roots were still alive three years after the eradication of the stumps, a point of considerable importance in connexion with the risk of infection from this source.

Good control of mouldy rot [*Ceratostomella fimbriata*] was given by the application to the tapping surfaces of Socony product 2295 A mixed with 5 to 10 per cent. carbolineum [ibid., xviii, p. 579].

The incidence of bark or foot rot [ibid., xvi, p. 798] has been greatly reduced by the adoption of a rational tapping system, in which the iron latex cup supports are replaced by rattan or bamboo cords and stringent precautions are taken against the infliction even of slight injuries.

Mildew [*Oidium heveae*] was generally mild and no special treatment was required to control it, but in the Lower Palembang district infection was rather more severe than usual, especially in the BD. 5 and War. 1 monoclone blocks.

Top die-back of coffee [ibid., xvii, p. 171] developed in a severe form on an estate hitherto free from the disease. Control was effected by intensive daily pruning for 35 days. Brown root rot [*F. noxius*], originating in a sickly lamtoro [*Leucaena glauca*] cover crop, also caused much damage.

Tea was attacked by black and brown root rots (*Rosellinia arcuata* and *F. noxius*), *Colletotrichum camelliae* [*Glomerella cingulata*: ibid., xviii, p. 579], and *Pestalozzia theae*. Seedlings were affected by the 'bitten-off' disease [ibid., xvi, p. 798] on neutral to alkaline soils with a low humus content, the application of sulphur to which resulted in an improvement.

Cinchona was attacked by [unspecified] root rots, pink disease [*Corticium salmonicolor*], and stem rust [ibid., xviii, p. 579], the last-named being the most prevalent and troublesome disease of the crop at the moment. No fungi or bacteria having been isolated from the affected tissues, the writer is inclined to attribute the disorder either to a virus or to adverse physiological conditions. A species of *Rhizoctonia* was responsible for collar rot of seedlings [ibid., v, p. 193; vii, p. 308].

Pepper (*Piper nigrum*) diseases included foot rot [*Phytophthora palmivora* var. *piperis*: ibid., xvii, p. 162], and pink disease [*Corticium salmonicolor*: ibid., xiv, p. 152].

Verona (O.). **Sul meccanismo di azione dei sali di potassio nella resistenza allo sviluppo delle malattie batteriche delle piante.** [On the mechanism of action of potassium salts in resistance to the development of bacterial diseases of plants.]—*Nuovo G. bot. ital.*, N.S., xlv, 1, pp. clxxiv–clxxviii, 1 fig., 1 graph, 1938. [Received June, 1939.]

Preliminary tests having indicated that tumours produced on *Ricinus* [*communis*] plants following inoculation with *Bacterium tumefaciens* were of less weight in plants given applications of potassium chloride, potassium sulphate, or potassium phosphate than those produced on inoculated but untreated controls, the author carried out an experiment in which *Ricinus* plants were grown in sand in pots to which were added salts of calcium, potassium, sodium, magnesium, and ammonium, alone or in various combinations, or powdered sulphur, untreated pots being

left as controls. The plants were inoculated with *Bact. tumefaciens* 13 days after sowing by means of a needle puncture, and the experiment was concluded a month later, when the average fresh weight of the tumours in the fourteen series varied from 2·6 to 5·23 gm.

The data obtained are considered to indicate that the nitrates used favoured the growth of the tumours, while the chlorides and sulphates impeded it; that sulphur was unfavourable to tumour development; and that the cations had no particular effect. The beneficial effect of the potassium salts would appear to be due more to the anion than the cations.

HASSEBRAUK (K.). **Untersuchungen über die physiologische Spezialisierung des Weizen- und Haferschwarzrostes in Deutschland im Jahre 1937.** [Studies on the physiologic specialization of Wheat and Oats black rust in Germany in the year 1937.]—*Arb. biol. Anst.* (*Reichsanst.*) *Berl.*, xxii, 4, pp. 479–482, 1939.

Continuing his studies at the Gliesmarode (Brunswick) branch of the Biological Institute on physiologic specialization in the black rusts of wheat and oats (*Puccinia graminis tritici* and *P. g. avenae*) in Germany [*R.A.M.*, xvii, p. 225] in 1937, the writer recognized in 28 collections of the former, mostly from the south, the races 2, 14, 21, 23, 24, 27, 40, and 133, and differentiated three new ones, E, F, and G the reactions of which to the 12 test varieties are given.

A comparison of the wheat black rust population of 1937 with that of 1934–5 presents a totally different picture, race 14 (which appeared only once in the earlier year in a Greek collection) predominating in the later year, while conversely, 40 (the principal source of inoculum in 1934–5) was found in only one lot of material from Baden in 1937. Race 21, formerly common, was also rare in 1937, developing only in two collections from the Ulm district. Except for 24, observed by Dodoff in Bulgaria in 1934 [ibid., xiii, p. 500], all the other races identified in 1937 are new for Europe.

The physiologic races of *P. g. avenae* occurring in 1937 in collections were 1, 1a (differing from 1 in its failure to attack Joanette Strain), 2, 4, 6, 8, and a new race 11, producing severe infection on Richland and Victory, while White Russian was moderately resistant and Joanette Strain practically immune. The latter variety has further maintained a high degree of resistance to races 1 and 4. Races 6 and 11 preponderated. As in the case of *P. g. tritici*, the 1937 population of *P. g. avenae* showed considerable differences as compared with that of 1934–5, though the paucity of material available for investigation in both years prevents any definite conclusion as to the actual incidence of the various races. It would appear, however, from the information at present to hand that Europe is richer than the United States in physiologic forms of black rust of oats.

MCFADDEN (E. S.). **Early Blackhull resists stem rust in Texas.**—*Phytopathology*, xxix, 7, pp. 644–645, 1939.

In tests conducted in experiment stations in Texas Early Blackhull winter wheat has shown a high degree of early resistance to stem rust (*Puccinia graminis tritici*), remaining consistently almost unaffected for

about two weeks after other varieties that head at the same time have become heavily diseased. About a week or ten days before ripening Early Blackhull generally shows a light to moderately abundant infection of small, isolated pustules. This behaviour has been consistent in the presence of races 1, 11, 17, 21, 24, 36, 38, 49, 50, and 56, so that either the variety possesses early resistance to several races or the fungus requires a long incubation period on it.

In crosses between Early Blackhull and varieties carrying the Hope type of mature-plant resistance to stem rust, an occasional F_2 plant remained entirely rust-free early and late under conditions in which both parents became heavily infected. Early Blackhull would seem to be of much value as a parent for breeding purposes.

Hassebrauk (K.). **Untersuchungen über den Einfluss einiger Aussenfaktoren auf das Anfälligkeitsverhalten der Standardsorten gegenüber verschiedenen physiologischen Rassen des Weizenbraunrostes.** [Studies on the influence of some external factors on the susceptibility reaction of the standard varieties to various physiologic races of Wheat brown rust.]—*Phytopath. Z.*, xii, 3, pp. 233–276, 1939.

The standard assortment of wheat varieties used for the determination of physiologic specialization in brown rust (*Puccinia triticina*) [*R.A.M.*, xvii, pp. 226, 663; xviii, p. 299], viz., Malakoff, Carina, Brevit, Webster, Loros, Mediterranean, Hussar, and Democrat, together (in some of the tests) with various other varieties, were inoculated in the seedling stage at the Gliesmarode (Brunswick) branch of the Biological Institute with various races of the pathogen, left covered for 48 hours, and then exposed to varying environmental conditions.

As a rule low temperatures (e.g., a mean of 6° C. as compared with the normal of 20°) intensify susceptibility to *P. triticina*, but certain varieties, Carina and Brevit, for instance, consistently react by increased resistance. In other cases the response of a given variety to a drop in temperature may depend on the physiologic race used for inoculation. Usually continuous maintenance under bell-jars either makes no difference to varietal reaction or increases resistance, but Carina and Brevit (also Hussar in poor soil) acquire enhanced susceptibility to certain races of the rust in these conditions. The two first-named varieties are similarly affected by a curtailment of the normal light supply which ordinarily tends, if anything, to increase resistance. They further deviated from the other standard varieties in the development of a marked weakening of resistance (x type of infection) as a result of nitrogen deficiency, in older leaves especially.

The investigations showed that such environmental aberrations are calculated to preclude a reliable identification of races 10, 19, 9, C, 17, 13, 20, and 31 of *P. triticina* by present methods. It is of great importance, therefore, to maintain optimal external conditions in specialization studies, and in this connexion the question of the substitution of more uniformly reacting varieties for the very unstable Carina, Brevit, and Hussar also demands careful consideration. Another point of interest arising from these observations is the varying influence of

surrounding conditions on the type and incidence of infection, these two factors being by no means consistently affected either in the same direction or to a like extent.

Săvulescu (T.) & Sandu-Ville (C.). **Încercări pentru stabilirea raselor fiziologice la cele două specii de Tilletia ce produc malura Grâului în România.** [Investigations on the physiologic races of two species of *Tilletia* causing bunt of Wheat in Rumania.]—*Anal. Inst. Cerc. agron. Român.*, x (*1938*), pp. 518–631, 1939. [German summary.]

Of the two species of *Tilletia* causing bunt of wheat in Rumania, *T. foetens* [*R.A.M.*, xvii, p. 655] is stated to be more prevalent than *T. tritici* [*T. caries*: loc. cit.]. Collections of the two species from all parts of the country were separated on the basis of their virulence to a test assortment of ten wheats into ten physiological races, five of *T. foetens* and five of *T. caries*, race V being in each case the most virulent, race I the least, and races II, III, and IV intermediate. Among the five races of *T. caries* race V is the most frequently found, followed by race IV. Races I and II differ from the others, apart from being less virulent, in that their spores measure 19·28 to 19·97 μ in diameter, while those of the other three races measure 16·9 to 18 μ. Two races of *T. caries*, named X and Y, were found on the introduced variety Rimpau's Early Hybrid and Varonne, race X approximating to race II in virulence but having larger spores, and race Y, which was also found on a sample of *Triticum monococcum* from Şona, approximating to race IV in virulence but again having larger spores. Among the five races of *T. foetens*, which show no divergence in the size of spores and are differentiated only by the degree of virulence, the most frequent is race III; in some districts this is the only one present. It is pointed out that the above-described races are not physiologic races in the strict systematic sense, each constituting, probably, a complex of races, which could be separated by using a larger test assortment and conducting cultural experiments on artificial media.

Fischer (G. W.). **Studies on the susceptibility of forage grasses to cereal smut fungi. III. Further data concerning Tilletia levis and T. tritici.** —*Phytopathology*, xxix, 7, pp. 575–591, 2 figs., 1939.

Continuing his investigations [*R.A.M.*, xviii, p. 665], the author carried out inoculation experiments which showed that *Agropyron inerme*, *A. spicatum*, *A. trichophorum*, and *Sitanion jubatum* may act as hosts to *Tilletia levis* [*T. foetens*] and *T. tritici* [*T. caries*].

When 20 selections of *A. cristatum* and 16 of *A. pauciflorum* were each inoculated with each of 8 races of *T. foetens* and 11 of *T. caries*, on *A. cristatum* some races of *T. foetens* (such as L–3 and L–6) and some of *T. caries* (such as T–2 and T–8) were several times as virulent as others, such as T–1, T–3, T–9, and T–11 [ibid., xvii, p. 165]. On *A. pauciflorum* the differences in relative virulence were even greater, race T–10 being 10 to 14 times as virulent as races L–7, T–6, and T–11. *T. foetens* appears to l about 35 per cent. more virulent than *T. caries* on *A. cristatum*, and slightly less virulent on *A. pauciflorum*.

While none of the selections of *A. cristatum* was entirely immune from

T. foetens, a few were highly resistant, and several were moderately susceptible, with average percentages of infection ranging from 24 to 32 per cent. One selection of *A. cristatum* appeared to be immune from *T. caries*, some were highly resistant, and others were moderately susceptible. Eight of the 16 selections of *A. pauciflorum* appeared to be immune from all eight races of *T. foetens*, only two were moderately susceptible, and the rest were more or less resistant. Selections resistant to *T. foetens* were, in general, also resistant to *T. caries*. One selection was susceptible to all 11 races of *T. caries*. As a species, *A. cristatum* is more susceptible to wheat bunt than *A. pauciflorum*.

The evidence obtained indicated that the mycelium of *T. foetens* and that of *T. caries* are perennial in perennial hosts, but not indefinitely so, the number of infected plants in nursery rows becoming less each year.

Inoculation experiments with bunt balls of *T. caries*, found in sweet clover seed but obviously originating from some grass, indicated that the collection belonged to race T–8.

In the author's experiments, plants infected by *T. caries* tended to be stunted.

Sanford (G. B.). **Research on certain soil-borne diseases as affected by other micro-organisms.**—*Sci. Agric.*, xix, 10, pp. 609–615, 1939.

This is a discussion on the problems of soil-borne diseases, chiefly root rots of wheat (*Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium culmorum*), as affected by antibiosis and related phenomena, based on the author's own and other workers' experiments [*R.A.M.*, x, pp. 417, 719; xi, p. 169; xii, p. 18, *et passim*]. The results obtained in this research suggest that certain soil-borne pathogens are attacked and sometimes destroyed by antagonistic micro-organisms. It is pointed out, however, that this antagonistic action is very complex in natural soil and may be weaker than in sterilized soil or on synthetic media. Some recently discovered growth-promoting substances produced by plants or micro-organisms, such as pantothenic acid (found by R. J. Williams *et al.* to be widely distributed in the cells of animals and plants—*J. Amer. chem. Soc.*, lv, pp. 2912–2927, 1933) and others, may also play an important part in the persistence of the pathogen. The need for careful research on the pertinent problems is emphasized and various questions of importance arising out of this work are briefly reviewed.

Stewart (A. M.), Teakle (L. J.), & Thomas (I.). **Recent experiments with 'minor' elements in Western Australia. III. Response of Wheat to copper on light lands at Wagin. IV. The effect of 'minor' elements on the growth of Wheat in other parts of the State.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xvi, 2, pp. 135–147, 4 figs., 1939.

The work described in the first of these papers (by Stewart and Teakle) has already been noticed from another source [*R.A.M.*, xviii, p. 547]. In the second paper Teakle and Thomas describe experiments which showed that the use of minor elements failed to improve the yield of wheat on soil types at Cleary, Salmon Gums, and Wongan Hills, and in some cases were definitely injurious.

Straib (W.). **Weiterer Beitrag zur Frage der Spezialisierung von Puccinia glumarum (Schm.) Erikss. et Henn.** [A further contribution to the question of specialization in *Puccinia glumarum* (Schm.) Erikss. & Henn.]—*Arb. biol. Anst.* (*Reichsanst.*) *Berl.*, xxii, 4, pp. 571–579, 1939.

For the first time the method of differentiating physiologic races of yellow rust (*Puccinia glumarum*) of wheat and barley [*R.A.M.*, xviii, p. 512] was supplemented at the Gliesmarode (Brunswick) branch of the Biological Institute by tests of uredospore germination, the outcome of which indicated that, in general, divergences of germinative capacity are correlated with differences of infectivity. In addition to the widespread race 23 of *P. glumarum* on barley, another (46) was isolated from German and Bulgarian material, while the predominant race on wheat (7) was found to be accompanied by another, 41, recognizable by its ability to attack Webster (immune from 7) in a very mild form. Two more new races of *P. glumarum* on wheat (43 and 44) originated in the Alps, not hitherto investigated for their rust flora. Another new one from Japan (42) is characterized by its severe pathogenicity to Chinese wheat. The Bulgarian wheat collections yielded races 6 and 16 of the yellow rust, not hitherto recorded from that country. Two races, namely, 45 (causing severe and moderate infection, respectively, of Fong Tien and Estanzuela 75 barley, Heil's Franken being immune) and 47 from *Agropyron repens*, were separable from 46 and 28, respectively, only on the basis of differences in uredospore germination.

These data are considered to denote the importance of progressive mutation in the origin of new yellow rust races.

Standen (J. H.). **Prevalence of Basisporium gallarum in arrested axillary shoots and secondary ears of Maize.**—*Phytopathology*, xxix, 7, pp. 656–657, 1939.

Infection of arrested axillary shoots of maize by *Basisporium gallarum* [*Nigrospora* spp.: *R.A.M.*, xvii, pp. 519, 670; xviii, p. 18] was first observed in Iowa in the autumn of 1937, 77 (or 42·3 per cent.) of 182 such shoots collected from different localities being attacked, though in the same year the percentage of infected ears was so low that the estimated loss due to it amounted to only 1 per cent. In 1938 infection was more general, and extensive examination of arrested axillary shoots in the autumn showed average infection in open-pollinated dent maize, inbred lines, and single crosses, of 65·51 to 80·59 per cent. Secondary ears were more frequently infected than primary ones; of 604 paired primary and secondary ears in three localities 307 secondary and only 13 primary ears were infected. Of 97 secondary ears whose weight exceeded $\frac{7}{10}$ that of the respective primary ear, only 5 were infected, whereas 273 secondary ears, none exceeding one-third of the weight of the respective primary ear, included 191 infected ears. Arrested axillary shoots and poorly developed secondary ears are evidently the most susceptible tissues of the maize plant, and their extensive infection produces abundant inoculum in sites adjacent to a large percentage of the primary ears.

PERRY (J. C.). **Some observations on psorosis in the light of experience of 25 years.**—*Calif. Citrogr.*, xxiv, 8, pp. 276, 290–293, 1 fig., 1939.

Data on the scraping treatment of psorosis of citrus [*R.A.M.*, xviii, p. 671] in 12 orchards in California (11 of Washington Navel and 1 of Valencia oranges) compiled during the last 25 years show that 63 per cent. of the old trees and 68 per cent. of the younger ones were still apparently cured two years after the first treatment, and 44 per cent. of either class ten years after the first treatment. Counts in the largest of the orchards during three years showed that of the total number of trees treated 13 per cent. were new cases, the remainder having been treated before. Bark symptoms rarely occurred before the sixth or seventh year after planting, and 70 per cent. of all cases originated 12 to 16 years after planting. For trees bearing a very advanced psorosis spot on only one side of the trunk a side-gouging treatment is recommended, involving cutting a vertical strip through the bark and into the wood on each side of the diseased area and then scraping the sound bark on the side of each cut slightly and the partially isolated diseased side more heavily.

MAYNE (W. W.). **A note on the origin of attacks of leaf disease (Hemileia vastatrix) in Coffee estates.**—*Plant. Chron.*, xxxiv, 14, p. 417, 1939.

After pointing out that investigation has already shown that one of the chief factors determining the severity of outbreaks of coffee leaf disease (*Hemileia vastatrix*) [*R.A.M.*, xvii, p. 813] in India is the amount of affected leaf carried over during the dry period preceding the outbreak, the author states that while the last season in Mysore was very dry and very few pustules of *H. vastatrix* could be found at the Experiment Station, on 22nd June numerous well-developed pustules were discovered on a large number of trees in a moist ravine. It would appear that under very suitable conditions comparatively small areas of coffee may serve as dangerous reservoirs of infection. Where control measures against *H. vastatrix* are necessary, special attention should be devoted to these sites. If they are very small, it may be possible to remove and destroy a large proportion of the infected leaves during the dry weather before the blossom showers. Such areas should also be given an early spraying, followed by a second a month or six weeks later.

GÖSSWALD (K.). **Über den insektentötenden Pilz Beauveria bassiana (Bals.) Vuill. Bisher Bekanntes und eigene Versuche.** [On the insectivorous fungus *Beauveria bassiana* (Bals.) Vuill. Information previously available and original experiments.]—*Arb. biol. Anst. (Reichsanst.) Berl.*, xxii, 4, pp. 399–452, 1 pl., 1939.

A detailed account of the writer's experiments with the insectivorous fungus, *Beauveria bassiana* [*R.A.M.*, xviii, p. 591], at the Biological Institute, Dahlem, Berlin, is supplemented by a useful survey of previous studies on various aspects of the organism and its effects on its hosts, and by a 15-page bibliography.

As in the case of the silkworm (*Bombyx mori*), all the ants used in the present series of trials, viz., *Lasius niger*, *L. flavus*, *L. umbratus*, *L. fuliginosus*, *Tetramormium caespitum*, and *Formica cinerea*, were destroyed to the extent of 100 per cent. at every stage of their

development, the eggs showing a striking red discoloration. The susceptibility of the following insects, not hitherto recorded as hosts of *B. bassiana*, was established by inoculations: *Cimex lectularius*, *Triatoma rubrofasciata*, *Piesma quadratum*, *Niptus hololeucus*, *Calandra granaria*, *Attagenus pellio*, *Dermestes lardarius*, *Coccinella bipunctata*, *Myzus persicae*, and *Sitodrepa panicea*, the last-named being very resistant. Of two strains of the fungus, from *Carpocapsa pomonella* and *L. niger*, the latter proved to be the more virulent. The inoculum may be introduced into ants (and bees, already known to be liable to attack by the fungus) either cutaneously or *per os* in honey or dextrose, the former method inducing a more acute type of infection.

A satisfactory culture medium for *Beauveria bassiana* was provided by potato or oatmeal agar with an admixture of diastase, trypsin, peptone, or ovomaltine, and of ground ants. The vitality of the spores was well conserved in a dry atmosphere with protection from sunlight. The hosts are destroyed both under and outside their own optimum environmental range and that of the pathogen. At 100 and 5 per cent. relative humidity the average times elapsing between inoculation and death were 7·4 and 3·1 days, respectively, the corresponding figures for 90, 75, 55, and 25 per cent. being 10·4, 9, 9·5, and 6, respectively; the incidence of mortality was 100 per cent. in all cases. At temperatures of 30°, 28°, 25°, and 20° C. the number of days required for the production of lethal effects was 6·6, 7, 7·4, and 8, respectively.

In ants the mycelium of *B. bassiana* develops only under the influence of high atmospheric humidity (optimum 100 per cent.), but in the case of larger insects, e.g., old larvae of *Bombyx mori*, it does so also under dry conditions, since the moisture of the host suffices. The same applies to the fructifications, except that here a slightly lower relative humidity is preferable. Spore production is more abundant at 25° and 20° than 30°, and mycelial growth is also particularly luxuriant at the former temperatures in conjunction with a humid atmosphere.

Among the problems discussed in connexion with the résumé of relevant literature are the technique of the fungal control of noxious insects; the economic importance of *Beauveria bassiana* for this purpose (judged to be considerable, though against this desirable attribute must be set the toxicity of the organism to useful insects, such as silkworms); the symptomatology of the pathogen and its mode of infection, in relation to which the writer found that the progeny of silkworms fed on diastase are particularly susceptible; specific reactions to *B. bassiana* in various insect groups; the taxonomy of the genus *Beauveria*; and the geographical distribution and host range of *B. bassiana* and other important species.

A special section is devoted to the fungal diseases of ants, a new pathogen of which, acting similarly to *B. bassiana*, was found in *Isaria strigosa* (on *L. niger*).

Petch (T.). **Notes on entomogenous fungi.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 127–148, 1939.

This further contribution [*R.A.M.*, xvii, p. 240] includes observations on 26 entomogenous fungi, among which the following may be mentioned: a single specimen of *Empusa grylli* was found in Yorkshire

on a grasshopper, this being the first record for England. When first found on *Cordyceps entomorrhiza* the fungus *Stilbella setiformis* was assumed to be its conidial stage, but the author is now of opinion that it is identical with *S. ramosa* and is parasitic on the clava of *C. entomorrhiza*. *Tilachlidiopsis nigra* [ibid., xvi, p. 532] is similar to, but distinct from, *S. ramosa* and is a *Cordyceps* clava parasitized by a *Stilbella*. In large branched specimens of *S. ramosa* the main stem is usually that of the host, i.e., *Hirsutella* or *Cordyceps*, the lateral branches being the simple *Stilbella*.

Linford (M. B.) & Yap (F.). **Root-knot nematode injury restricted by a fungus.**—*Phytopathology*, xxix, 7, pp. 596–609, 1 fig., 1939.

A full account is given of a pot culture experiment in which pine-apple plants were grown in sterilized soil infested with larvae of *Heterodera marioni* with and without the addition of cultures of the following nematode-trapping fungi: *Arthrobotrys oligospora* [*R.A.M.*, xviii, p. 675], *Dactylella ellipsospora* [ibid., xviii, p. 676], *A. musiformis* [ibid., xvii, p. 36], *Dactylaria candida* [loc. cit.], and *D. thaumasia* [loc. cit.]. During fifteen months of continuous plant growth *D. ellipsospora* restricted nematode injury to a moderate but statistically significant extent. The evidence also strongly indicated that the other fungi tested act similarly, though to a less marked degree. It is concluded that nematode-capturing fungi are beneficial members of the soil flora that should be considered when questions of nematode control arise.

Harris (L. H.). **The nature of the grain dust antigen. Crossed reactions to grain dusts and smuts.**—*J. Allergy*, x, 5, pp. 433–442, 5 diags., 1939.

Continuing his observations in Ohio on 13 patients allergic to grain dusts and smuts [*R.A.M.*, xviii, p. 679], the writer reports the data obtained in cross-testing experiments between wheat and oat dusts and smuts (*Ustilago tritici*, and *U. levis* [*U. kolleri*] and *U. avenae*). It was found that wheat dust and *U. tritici* will neutralize each other reciprocally *in vivo* and *in vitro* and probably have a common antigen, as is also in all likelihood the case with oat dusts and the two oat smuts. No evidence could be obtained, however, of any antigenic relationship between grain dusts and common moulds, such as *Alternaria*, *Helminthosporium*, or *Rhizopus* spp.

Hollaender (A.) & Emmons (C. W.). **The action of ultraviolet radiation on dermatophytes. I. The fungicidal effect of monochromatic ultraviolet radiation on the spores of Trichophyton mentagrophytes.**—*J. cell. comp. Physiol.*, xiii, 3, pp. 391–402, 4 graphs, 1939.

At the Washington Biophysical Institute spores of *Trichophyton mentagrophytes* [*R.A.M.*, xviii, p. 522], isolated from a typical case of 'athletes' foot', were suspended in a physiological salt solution and exposed at 18° C. to measured quantities of ultra-violet radiation through a wave-length range of 2,180 to 3,150 Å. The most effective region for inactivation was found to lie between 2,537 and 2,650 Å. Besides the strain 598, used in the majority of the tests and characterized by the almost exclusive production of microconidia, 2·5 to 4 by

2 to 2·5 μ, four others were investigated for their susceptibility to irradiation, viz., 597, closely resembling the foregoing; 594, forming in addition to small spores large numbers of clavate, multicellular macroconidia, 40 to 70 by 6 to 10 μ; 602, similar to 594; and 604, which secretes a water-soluble pink pigment diffusing into the medium and absorbing a part of the radiation. The data for 50 per cent. inactivation of the four aberrant strains showed wider variations than those recorded for 598, the response of which was comparatively uniform.

In a concluding discussion it is pointed out that the wave-lengths comprised within the toxic range are those most highly absorbed by nucleic acids rather than by proteins.

Moore (M.). **The chorio-allantoic membrane of the developing chick as a medium for the cultivation and histo-pathologic study of pathogenic fungi.**—*Science*, N.S., lxxxix, 2318, p. 514, 1939.

Investigations by the author have shown that the chorio-allantoic membrane of the developing chick can be successfully utilized for inoculations with fungi pathogenic to man. The method is much less expensive than any entailing the use of laboratory animals and reduces the time required for the experiments to a matter of days.

Wickerham (L. J.) & Rettger (L. F.). **A taxonomic study of Monilia albicans with special emphasis on morphology and morphological variation.**—*J. trop. Med.* (*Hyg.*), xlii, 12, pp. 174–177; 13, pp. 187–192; 14, pp. 204–216, 30 figs., 1939.

This is a detailed account of the authors' morphological and taxonomic studies at Yale University on *Monilia* [*Candida*] *albicans* [*R.A.M.*, xviii, p. 592], 39 strains of which were isolated from the human vagina, four from faeces, while of those received from other workers seven originated in the sputa of tuberculous patients and ten in lesions on poultry.

It was found that consistent fermentation reactions are obtainable when optimum quantities of carbohydrates, nitrogenous material, and molecular oxygen are supplied, the best results being given by filling the tubes to a depth of 8 cm. with a medium containing 2 per cent. carbohydrate, 0·3 per cent. each of yeast extract and peptone, and bromthymol blue. All the strains were found to possess certain common characteristics, while some showed features peculiar to themselves. Environmental factors played an important part in the morphological development of the different strains. These observations suggest that the classification of *Monilia* should be based on a broad conception of morphological characters rather than on slight and variable details. For instance, *M. albicans* should be regarded as comprising all strains that form hyphae giving rise to clusters of blastospores and (or) terminal chlamydospores, and inducing typical fermentation reactions in dextrose, maltose, sucrose, and lactose, the latter criterion being particularly valuable in clinical diagnosis. The strains under investigation were arbitrarily divided into five overlapping morphological types, according to the relative numbers of chlamydo- and blastospores produced on maize meal agar, and the reactions of ten representative members to variations in oxygen tension, age, medium, and temperature ascertained.

The authors, in common with most American workers, advocate the retention of the name *Monilia* (though admitting the botanical superiority of *Candida*) pending a general agreement among mycologists on the classification of the genus.

Joulia (P.) & Le Coulant (P.). **Les épidermomycoses généralisées de la seconde enfance par champignons levuriformes.** [Generalized epidermomycoses of the second period of childhood due to levuriform fungi.]—*Ann. Derm. Syph., Paris*, Sér. 7, x, pp. 545–570, 9 figs., 1939.

This is a very detailed account of the clinical features of two cases of generalized epidermomycosis in children, one (acute) in a ten-year-old girl, and the other (chronic and ultimately fatal) in a boy aged eight at the onset of the disease, the course of which was followed for six years. Mycological studies (made in the second case only) revealed *Monilia* [*Candida*] *albicans* [see preceding abstract] as the agent of the disease.

Godfrey (G. H.) & Rich (H.). **Pasmo disease of Flax in the Lower Rio Grande Valley of Texas.**—*Plant Dis. Reptr*, xxiii, 11, pp. 194–195, 1939. [Mimeographed.]

Notes are given on the varietal reaction of flax in an experimental planting in the Lower Rio Grande Valley, Texas, to *Phlyctaena linicola* (*Sphaerella linorum*) [*R.A.M.*, xviii, p. 595]. Punjab was the most susceptible on a stem lesion basis, with a rating of 2·48 (5 being the maximum for very severe infection), roughly corresponding to a low-medium intensity involving perhaps 25 per cent. loss of stand, and Bolley Golden the most resistant (0·00), with no stem lesions (but considerable foliar invasion). The ratings for Buda, Rio (treated seed), N[orth] D[akota] 114, Bison, Rio (untreated), Argentine, Abyssinian Yellow, Linota, Redwing, and Giza were 0·08, 0·20, 0·98, 1·06, 1·34, 1·36, 1·44, 1·53, 2·28, and 2·31, respectively.

Calvino (Eva M.). **Malattie rare o poco note segnalate nell' anno 1938.** [Rare or little-known diseases recorded in the year 1938.]—*Riv. Pat. veg.*, xxix, 5–6, pp. 261–271, 4 figs., 1939.

Of the four plant diseases recorded in this paper from the vicinity of San Remo the following may be mentioned. *Iris germanica* plants of four varieties imported from England, growing near Cap Martin, very close to the sea, developed dirty white flowers and also showed abnormal leaf and flower characters [unspecified]. When rhizomes from affected plants were grown in pots, development was poor, the leaves were pale and showed light green and yellowish stripes and spots, and the flowers had white petals with pale violet stripes. Light violet mottling was noted on the midrib of the stigmas, and violet spots and mottling were present on the floral bracts. The condition is diagnosed as mosaic [*R.A.M.*, xvi, p. 728], and is apparently closely analogous with 'complete break' of tulips [ibid., xviii, pp. 318, 528, 726].

Pelargonium zonale plants of the variety Millionaire growing outdoors were affected by a form of leaf curl [cf. ibid., xvii, p. 797] closely resembling Pape's virus-caused 'kräuselkrankheit' [ibid., vi, p. 728]. Small, yellowish-white spots developed on the under surface of the

leaves, became confluent, then appeared on the upper surface, and became brown and dry. The leaves became misshapen, twisted, perforated, and lacerated. On a few old plants the leaves appearing on new branches were all malformed.

Pestalozzia palmarum [ibid., xvi, p. 670] caused a leaf spot of *Phoenix canariensis*.

Ark (P. A.) & Tompkins (C. M.). **Bacteriosis of tuberous Begonia.**—*Phytopathology*, xxix, 7, pp. 633–637, 2 figs., 1939.

For several years past tuberous begonia (*Begonia tuberhybrida*) plants in nurseries in California have been affected by a leaf spot apparently favoured by high atmospheric humidity, relatively high temperatures, and close contact between the plants. Small, circular, blister-like spots, later becoming very conspicuous and transparent when examined by transmitted light, appear on the leaves, enlarge, and coalesce into large, water-soaked, necrotic areas sometimes (on dry specimens) exuding a yellow, dry ooze. Premature abscission of the leaf occurs.

Invasion of the vascular system was noted only in the greenhouse after spraying the plants in a moist chamber with a heavy water suspension of the organism isolated from affected material. After 8 to 12 days the plants were transferred to a warm greenhouse, when they developed a water-soaked appearance of the petioles, which spread into the main stem, with gradual softening of all tissues, and led finally to the entire collapse of the plants. Abundant bacteria were observed in the vascular elements and in all cases the organism isolated was identical with that sprayed on the plants, and was found by inoculation to be pathogenic to tuberous begonia leaves.

Further inoculation tests showed that *B. gracilis luminosa* and *B. lloydii* were also highly susceptible. Among the fibrous-rooted types (*B. semperflorens*) infection was obtained on Christmas Cheer, Fire Dwarf, Prima Donna, Rosabelle, Salmon Queen, and Vernon, as well as on the species *B. erfordii*, *B. haageana*, and *B. schmidtiana* var. *rosae*. Infection of the same species and varieties also resulted from spraying with a culture of *Phytomonas* [*Bacterium*] *flavozonatum* [*R.A.M.*, xvii, p. 749].

A comparative study of six different isolates of the leaf spot organism from different parts of California and *Bact. flavozonatum* showed no fundamental difference in morphological or cultural characters. The authors' organism also agreed completely with the description of *Phytomonas* [*Pseudomonas*] *begoniae* [loc. cit.]. It is accordingly suggested that the name *Phytomonas* [*Pseudomonas*] *begoniae* be retained for the organism, with *Bact. flavozonatum* as a synonym [ibid., xvii, p. 602].

Aronescu-Săvulescu (Alice). **Contribuțiuni la studiul ruginii de pe Gura Leului (Puccinia antirrhini Diet. et Holway).** [Contributions to the study of Snapdragon rust (*Puccinia antirrhini* Diet. & Holway).]—*Anal. Inst. Cerc. agron. Român.*, x (*1938*), pp. 473–517, 14 figs., 3 graphs, 1939. [Rumanian, with French translation.]

Severe attacks of snapdragon (*Antirrhinum majus*) rust [*Puccinia antirrhini*: *R.A.M.*, xviii, p. 457; xvii, p. 655] have occurred in Rumania

during 1937 and 1938, the period of infection lasting till late in November in spite of slight frosts. In the laboratory the uredospores of the fungus germinated best at temperatures between 7° and 18° C., the lower and upper temperature limits being 0° and 28°; under natural conditions the uredospores were found to withstand a temperature of —6·7° and show 40 to 50 per cent. germination in the following spring. Infection took place within a wide temperature range, succeeding at 20° but not at 5°. On agar the uredospores germinated at P_H values between 3·6 and 12·4, with an optimum at 6·4 to 8·6. Of the fungicides tested, sulphur dusts gave the best results.

McWhorter (F. P.). **Botrytis blight of Antirrhinum related to trichome disposition.**—*Phytopathology*, xxix, 7, pp. 651–652, 1 fig., 1939.

About 25 per cent. of a number of After Glow and Cheviot Maid Supreme *Antirrhinum majus* plants in a greenhouse in Oregon broke off at about 2 ft. from the ground in November, 1938, as a result of infection by a *Botrytis* of a cinereal form of the type producing long, dark brown conidiophores. The outbreak occurred shortly after the plants had been sprayed with an insecticide. Examination of several hundred plants showed that the foci of primary infections corresponded with the areas where the surfaces of the stems changed from glabrous to hirsute. The glandular trichomes in the affected stem areas were full of *Botrytis* mycelium, and infection was observed to take place through the trichomes.

Pasinetti (L.). **'L'Aecidium haussknechtianum' P. Henn su 'Berberis vulgaris' L. osservato per la prima volta in Italia.** [*Aecidium haussknechtianum* P. Henn. on *Berberis vulgaris* L., observed for the first time in Italy.]—*Riv. Pat. veg.*, xxix, 5–6, pp. 273–280, 4 figs., 1939.

The author gives a full description of *Aecidium haussknechtianum* which he observed in 1934 heavily infecting barberry in Lombardy, a new record for Italy.

Orsini (G.). **Intorno a una malattia dell' Aucuba japonica. (Prima nota).** [On a disease of *Aucuba japonica*. (First note).]—*Riv. Pat. veg.*, xxix, 5–6, pp. 249–259, 8 figs., 1939.

In April, 1937, *Aucuba japonica* plants in a garden at Todi, Italy, developed a brown discoloration of the leaves, which showed slight rolling and the margins of which were undulating. The healthy tissues were sharply defined from the necrotic parts, which readily fell away. Infection usually began at the leaf apex, spread slowly over the whole surface, reached the leaf stalk, which turned light brown, and, after rains, produced on the shoot a brown lesion which spread in a circular fashion and also longitudinally up to about half the internodes. The part of the shoot near the round lesion died, and the tissues invaded by the mycelium withered completely. The disease was present during the whole year, but became arrested during summer. The upper surface of the discoloured parts of the leaves bore perithecia of a species of *Pleospora* distinct from *P. infectoria* var. *aucubicola*. Cultures originating from ascospores gave rise to a species of *Macrosporium* and the latter was

also produced on perithecia on diseased leaves placed in a moist chamber. Furthermore the *Macrosporium* produced the *Pleospora* stage in culture [cf. *P. herbarum* and *Stemphylium botryosum*: *R.A.M.*, xviii, p. 141]. Inoculations with the *Macrosporium* gave positive results. Further investigations are in progress.

Weiss (F.). **Flower-spot of Azaleas : directions given for identification and control.**—*Sth. Flor.*, xlvi, 22, pp. 5, 12–13, 16–17, 1939. [Abs. in *Exp. Sta. Rec.*, lxxxi, 2, pp. 232–233, 1939.]

This is a preliminary report on a recently recognized azalea disease caused by *Ovulinia azaleae* [abs. in *Phytopath.*, xxviii, p. 21, 1938] and occurring throughout the south-eastern and Gulf Coast States from North Carolina to Louisiana, other susceptible hosts including mountain laurel [*Kalmia latifolia*] and certain species of *Vaccinium*. Promising results in the control of the disease have been obtained by applications at three-day intervals, from the incipient coloration of the buds to the full opening of the flowers (coinciding with the ascospore discharge period), of copper sprays or dusts or a dilute acetic acid solution.

Tasugi (H.) & Ikeda (Y.). **Phytophthora blight of Hibiscus manihot.**—*Ann. phytopath. Soc. Japan*, ix, 2, pp. 69–85, 9 figs., 3 graphs, 1939. [Japanese, with English summary.]

Hibiscus manihot at In'nosima, Hirosima Prefecture, Japan, has for several years shown a blight of the leaves, stems, and roots caused by *Phytophthora parasitica*. Inoculation experiments with the fungus were successful on the original host and also on tomato, potato, cotton, egg-plant, broad bean [*Vicia faba*], and red pepper [*Capsicum annuum*], but not on tobacco.

Nijdam (F. E.). **Over het voorkomen van Botrytis anthophila (Bond.) bij inlandsche Roode Klaver.** [On the occurrence of *Botrytis anthophila* (Bond.) in home-grown Red Clover.]—*Tijdschr. PlZiekt.*, xlv, 3, pp. 121–124, 2 figs., 1939.

Following a brief résumé of previous work on the anther mould of clover (*Botrytis anthophila*) [*R.A.M.*, xviii, p. 115], the writer records the occurrence of the disease on the Roosendaal red [*Trifolium pratense*] variety in Holland in 1933, when two out of six plants destined for hybridization were found to be infected. Inoculation experiments gave a very low percentage of successful results (2 out of a total of 66 plants), but it has been observed that the disease may remain latent for two generations in the progeny of a cross involving one infected and one healthy parent, to reappear in the F_3. In such cases the number of spores in the apparently sound pollen is presumably so minute as to escape detection altogether.

Allison (J. L.). **Studies of monosporous cultures of Septoria bromigena.**—*Phytopathology*, xxix, 6, pp. 554–556, 1 fig., 1939.

On twelve artificial media, of which potato dextrose agar proved to be the most suitable for further studies, 200 monospore lines of *Septoria bromigena*, isolated from *Bromus inermis* in 1937, fell into four cultural groups according to the localities in Minnesota whence they originated.

Thus, the isolates from University Farm produced short, pink aerial hyphae with an outer zone of dark, leathery mycelium; those from Coon Creek formed a tough, leathery mycelial mat with very short, dark grey to brick-red hyphae; the Dundas strains were characterized by dark hyphae over a rough mycelial mat; and those from Waseca by white and dark hyphae over a solid, leathery mycelial mat. All the isolates normally gave rise to an abundance of pycnidia, but in some cultures variants arose producing few or none. In greenhouse inoculation tests the parent cultures were severely pathogenic to *B. inermis*, but the non-sporulating mutants caused no infection.

WALLACE (T.). **Magnesium-deficiency in fruit trees.**—*J. Pomol.*, xvii, 2, pp. 150–166, 1939.

Magnesium deficiency is stated to occur in a variety of crop plants in the eastern United States, Germany, Holland, Belgium, Czechoslovakia, New South Wales, and Canada on light, sandy soils, usually strongly acid in reaction and subject to excessive leaching by rain. The affected plants are characterized by chlorosis of the leaf tips and edges, later spreading towards the midrib, necrosis of interveinal tissue, and premature fall of the older leaves which are always the first affected. The chlorotic parts later become necrotic brown, and brittle. Instead of chlorotic symptoms affected parts may turn pale green in well-defined areas and then suddenly become brown and dry out as in apples, or develop well-marked patterns, usually in red, on the upper leaf surface as in the black currant. The leaves are very thin, with a prematurely formed abciss layer, which may be the cause of abnormal susceptibility to spray injury.

Data are presented on magnesium deficiency observed in apple trees grown on three different sites in England, sites I and II having strongly acid, leached soils deficient in lime and magnesium and site III deficient in magnesia only, the symptoms comprising the typical blotching on the first two sites but being somewhat less characteristic on the third site. With regard to control, the use of magnesian limestone (500 to 1,000 lb. per acre) has been found effective for annual plants on acid soils but may be slow in action for fruit trees. The quick-acting Epsom salts, kieserite, and sulphate of potash-magnesia do not contain calcium and should, therefore, be used, at a rate of approximately 1 cwt. per acre, on acid soils only in conjunction with calcium, while on neutral soils, in which the calcium status is satisfactory or high, they can be used in preference to others.

WILKINSON (E. H.). **A note on the prevalence of fungal spots and rots of Apples in cold store at Long Ashton.**—*Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 84–90, [1939].

Notes are given on the species of fungi causing rotting of apples (from trees grown under various treatments in different parts of England) placed in cold storage at Long Ashton. The fungus causing the most severe rotting and spotting was *Gloeosporium album* [*R.A.M.*, xviii, p. 533], followed in order by *Botrytis cinerea*, *Penicillium expansum*, *Sclerotinia fructigena* [ibid., xvii, p. 13], *Nectria galligena* [ibid., xvi, p. 323], *Alternaria* sp., *Rhizopus nigricans* [ibid., xv, p. 555], *G.*

fructigenum [*Glomerella cingulata*: ibid., xvii, pp. 465, 536], *Cephalothecium* [*Trichothecium*] *roseum* [ibid., xvi, p. 756], *Diaporthe* spp., and miscellaneous fungi (*Sphaeropsis malorum* [*Physalospora obtusa*: ibid., xvii, p. 69], *Pleospora pomorum* [ibid., xv, p. 424], and *Fusarium* sp.).

G. album effects entry through the lenticels, each lesion having a lenticel at the centre. All the samples stored in 1937 became infected by this fungus, which alone was responsible for 47 per cent. infection out of a total amount of 54 per cent. Worcester Pearmain apples from near Ross-on-Wye given low and high nitrogen treatment showed 10 and 31 per cent. infection by *G. album*, respectively. Cox's Orange Pippin from Chelmsford had 41 per cent. infection, while the varieties Bramley, Grenadier, and Derby appeared to be more resistant.

B. cinerea also caused much rotting among fruits showing stalk-end russeting, especially in the varieties Cox's Orange Pippin and Laxton's Superb. *P. expansum* usually played a minor part in the rotting of stored apples but caused severe damage as a secondary invader round scab [*Venturia inaequalis*] lesions in Worcester Pearmains from one locality. Rotting due to *S. fructigena* was most frequent in Bramley Seedling apples from East Malling (3 per cent.).

Pugsley (A. T.). **Silver leaf disease of fruit trees. Control measures recommended.**—*J. Dep. Agric. Vict.*, xxxvii, 5, pp. 220–221, 2 figs., 1939.

A popular account is given of the silver leaf disease (*Stereum purpureum*) [*R.A.M.*, xvi, p. 690] which has been recorded from widely separated districts in Victoria on apples, plums, and apricots, but in a few instances only does it appear to have established itself.

Fish (S.). **Summer spot of Pears.**—*Fruit World, Melbourne*, xl, 5, p. 7, 1939.

The continued development of pear black spot [scab] (*Venturia pirina*) during the summer in Victoria [*R.A.M.*, xvi, p. 187] is stated in some seasons to have rendered 25 per cent. of the crop unfit for export. During three years' tests, summer spot was consistently controlled by two pre-blossom applications of Bordeaux mixture (6–4–40), followed by a cover spray of Bordeaux mixture (3–3–50) three weeks after the fruit had formed. Maximum protection consistent with freedom from spray injury resulted when the first pre-blossom application was made at the late green tip stage, and the second at the green flower-bud stage. The treatment caused some russeting on sensitive green pear varieties, such as Packham's Triumph, but was quite satisfactory on less sensitive green varieties (such as William's B[on] C[hrétien]), brown varieties, Beurré Bosc, and Winter Nelis. Trials to find a substitute for the Bordeaux 3–3–50 spray, which is responsible for the russeting, were unsuccessful.

Smith (C. O.) & Cochran (L. C.). **Rust on the California native Pruni.**—*Phytopathology*, xxix, 7, pp. 645–646, 1 fig., 1939.

In a mixed planting at Riverside, California, of the native species *Prunus andersonii*, *P. demissa*, *P. emarginata*, *P. fasciculata*, *P. fre-*

montii, *P. ilicifolia*, *P. ilicifolia* var. *integrifolia*, and *P. subcordata* cultivated with other species of *Prunus* and *Amygdalus*, rust (*Tranzschelia* [*Puccinia*] *pruni-spinosae*) [*R.A.M.*, xvii, p. 756; xviii, p. 322] was often noted on the susceptible horticultural varieties of apricot, plum, and peach, and all the indigenous species listed were susceptible except *P. demissa* and *P. ilicifolia*. *P. emarginata* became infected after artificial inoculation in the open with spores taken from almond. Teleutospores of the *discolor* type were observed on *P. fasciculata*. The *typica* type of rust was not seen.

Blodgett (E. C.) & Colwell (W. E.). **Relation of drought spot of Prunes to boron content of fruit.**—*Phytopathology*, xxix, 7, pp. 650–651, 1939.

All four well-known types of drought injury on plum fruits [*R.A.M.*, xvi, p. 687] have been found in Idaho orchards, viz., gum spots (gum pocket disease), with crescent-shaped superficial scars; shrivelling for a fourth to a third of the length, with browning and blackening of the underlying flesh; shrivelling of the cheek, with brown lines of injured tissue extending through the flesh; and browning of the cells lining the pit cavity. Observations have shown that plums affected by gum (or drought) spot are very firm in flesh and of poor quality, and do not improve in storage. The firmness is largely due to dead, corky areas, and a pronounced sticking to the pit. Internal discoloration is common, especially near the pit. The condition constitutes a serious and neglected problem, especially in the dried fruits. It is most severe in years when irrigation is inadequate, especially on light, porous soils.

Preliminary data show a definite relation between the condition and a low boron content of the fruit tissues and pits. The condition is noticeably severe in one area where the soil is deficient in boron.

Christoff (A.). **Experiments and notes on the virus diseases of fruit trees in Bulgaria.**—*Bull. Soc. bot. Bulgarie*, viii, pp. 55–64, 1939.

These notes on various virus diseases of fruit trees in Bulgaria [cf. *R.A.M.*, xviii, p. 188] contain the following interesting observations. While during 1937 the symptoms of broad streak and narrow-striped variegation on plum and greengage trees [loc. cit.] were visible during the whole season, in the following year they were present only in early spring, and not only failed to appear on the new leaves but became masked on old ones. No explanation has yet been found for this phenomenon. The separation of these two diseases was successfully made on plum: three virus-free plum trees of the Kustendil variety budded with buds from a plum infected with broad streak developed symptoms of broad streak in the following season, while typical narrow-striped variegation appeared on three similar plum trees budded with buds from a plum infected with narrow-striped variegation. The latter disease was successfully transmitted by budding from plum to peach, after an incubation period of two years; greengage trees budded with buds from an apparently healthy Japanese plum (*Prunus salicina*) developed narrow-stripe symptoms in the following season, while the Japanese plum showed them only two years after budding. The double infection of a greengage tree with buds from a Kustendil plum having

narrow-striped variegation and from a Green Queen Claudia plum infected with mosaic produced the symptoms of both diseases, either simultaneously or first the one and then the other. When a row of greengage trees, either healthy or infected with star-like mosaic [loc. cit.], were budded with one and the same peach variety, all infected greengage stocks produced peach shoots with symptoms of chlorosis, substantiating the author's suggestion that star-like mosaic can be one of the causes of chlorosis of the peach.

Pear trees of the varieties Cure, Diel's Butterbirne, and Eniseika, which had shown symptoms of mosaic from 1935 to 1937, were free from them in 1938, possibly owing to excessive heat and long drought of this year. Buds from mosaic-diseased Cure scions, heated for 10½ to 11 minutes at temperatures of 40° to 60° C., successfully transmitted the disease to wild pear trees.

Evidence is adduced that chlorosis of apple and pear may result from infection by the mosaic virus which, it is thought, renders the trees sensitive to unfavourable soil and other conditions.

Brown (H. P.). **Gummosis and die-back of Cherry trees. A bacterial disease.**—*Agric. Gaz. N.S.W.*, 1, 7, pp. 386–388, 4 figs., 1939.

During the last few years, growers in New South Wales have found difficulty in the establishment of new blocks of cherry trees. Between planting and the early years of commercial cropping heavy losses have resulted from the death of 'leaders', and, in some instances, the young trees have died off. Many trees of most varieties show cankered or discoloured areas of bark copiously exuding gum. The evidence obtained showed that the disease was associated with an organism (the parasitic nature of which was demonstrated) identified on a basis of laboratory tests with *Pseudomonas mors-prunorum* [*R.A.M.*, xviii, p. 689]. A species of *Cytospora* and one of *Cylindrosporium* were frequently found fructifying on affected wood, but are considered to be secondary.

Inoculation tests under field conditions broadly confirmed the results of English workers. Attempts to isolate the organism from wood cankers during the warmer months were unsuccessful.

Control measures tentatively suggested are as follows. Pruning and other operations involving tree injuries should be effected in summer, soon after harvest, as wounds appear to afford an important means of entry. The trees should be well sprayed with Bordeaux mixture (3–2–40) early in the autumn and given a further application at double strength between late autumn and midwinter, using a spreader on both occasions.

Wallace (T.). **Summary of results of manurial experiments on Black Currants, Raspberries, and Strawberries at Long Ashton, 1924–1937.**—*Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 17–39, [1939].

In the manurial experiments summarized in this paper it was found that potash deficiency induced decreased susceptibility in black currants to *Pseudopeziza ribis*, while nitrogen and phosphate deficiencies appeared to increase susceptibility. Farmyard manure appeared to reduce susceptibility.

Schwartze (C. D.) & Huber (G. A.). **Further data on breeding mosaic-escaping Raspberries.**—*Phytopathology*, xxix, 7, pp. 647–648, 1939.

In small populations, produced by inbreeding the Lloyd George red raspberry variety (resistant to the mosaic vector *Amphorophora rubi* but heterozygous for resistance) [*R.A.M.*, xviii, p. 190] and crossing it with susceptible varieties, a few seedlings were resistant, and several varieties and seedlings somewhat resistant. Other data indicated that susceptible varieties may be homozygous.

Further evidence showed that relatively high percentages of seedlings resistant to *A. rubi* can be produced by crossing heterozygous parents, and strongly indicated that Lloyd George carried two or more factors for resistance, and that resistance is dominant to susceptibility. WSC22 (Lloyd George selfed, somewhat resistant) × Lloyd George gave a higher percentage of resistant hybrids than did crosses between Lloyd George and resistant parents. The somewhat resistant type would appear to carry at least one genetic factor for resistance.

There are now present in the breeding plots in Washington 111 hybrids, inbred seedlings, and named varieties on which *A. rubi* does not feed, and, owing to their parentage, most of these must be heterozygous for resistance. Further work in progress should give homozygous resistant individuals transmitting resistance to all their offspring when crossed with susceptible varieties.

Hildebrand (A. A.). **Notes on mealy bug injury on Strawberry and its resemblance to crinkle.**—*Canad. J. Res.*, Sect. C., xvii, 7, pp. 205–211, 6 figs., 1939.

Symptoms observed for several years on strawberry plants grown in the greenhouse in Canada and previously attributed to crinkle [*R.A.M.*, xviii, p. 604] were experimentally shown during 1938 to be primarily caused by mealy bugs, *Pseudococcus* spp., all 20 plants to which the insects had been transferred developing the condition. The points of similarity between the two troubles lie in the occurrence of translucent or chlorotic spots on young leaves with minute, more intensely chlorotic spots in the centres, in the uneven chlorosis and malformation of the older leaves, shortening of the petioles, and general dwarfing of heavily infested plants. The crinkled or rugose condition of the foliage remains a diagnostic symptom of crinkle, which is also often associated with clearing of the veins, a feature not observed in mealy bug injury.

Wardlaw (C. W.), Leonard (E. R.), & Barnell (H. R.). **Banana storage investigations, 1937–39.**—*Trop. Agriculture, Trin.*, xvi, 6, pp. 130–142, 2 pl., 1939.

In further investigations in Trinidad into the storage behaviour of Gros Michel bananas [*R.A.M.*, xiii, p. 252] the fruit was held at tropical temperatures for 24 to 36 hours, stored at 53° F. for 15 days, and finally ripened at 68°. It was found that the 'standard ¾-full' (English grade) bunches behaved normally, but that heavier bunches could not be kept in the green, unripe condition for more than 10 to 12 days at 53°. The effect of ripening at this temperature is shown by the development of a yellow colour, which becomes modified by sooty or bronze colours indicating low temperature injury. When placed at 68°, the heavier

grades showed rapid development of ripening and chilling colour, but later on the chilling colours were sometimes masked by a strong development of normal pigment. Chilling injury was much less marked in bunches ripened at 80 to 90 per cent. relative humidity than in those ripened at one of 70 per cent. Individual 'heavy ¾-full' and 'full' fingers (American grades) stored at 53° for 22 days and then transferred to 68° developed conspicuous chilling colours by the 22nd day, and later became tough and leathery.

Observations on fruits from plantations infected by *Cercospora musae* [ibid., xviii, p. 327], held at 53° for 15 days and then ripened at 68°, showed that affected fruit is characterized by buff-coloured pulp, ripens prematurely, chills during the period of refrigerated transport, and ripens too rapidly on removal to a higher temperature. The bunches remain small, and the fruit may be much more mature than its appearance suggests, with the result that it is likely to depart from the normal storage behaviour of its grade.

Bratley (C. O.) & Mason (A. S.). **Control of black rot of Pineapples in transit.**—*Circ. U.S. Dep. Agric.* 511, 12 pp., 1 fig., 1939.

Fourteen holding experiments in Puerto Rico and seven shipping experiments between Puerto Rico and New York with various materials for the control of black rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [*R.A.M.*, xvii, pp. 51, 761] of Red Spanish pineapples showed that the best results were given by a solution of 2½ gm. benzoic acid [ibid., xi, p. 192] in 100 c.c. of 30 per cent. alcohol applied to the cut stalk of the inoculated fruits with a small paint brush. The effectiveness of the treatment decreased as the period between inoculation and treatment increased. Treatment was most effective on fruits of 'mature green maturity'. Observations showed that much of the rot begins at packing bruises. For practical purposes 95 per cent. alcohol is denatured by the addition of 10½ oz. benzoic acid per gal. and the solution diluted with 3·2 times its volume of water. The pineapple after removal from the plant is carried to the end of the row, its base exposed to the sun's rays for two to four hours, and the solution applied by means of a brush. A man can treat from 8,000 to 12,000 fruits in an eight-hour day, and the cost for labour and material amounted to about half a cent per box of fruit. No injury to the fruit was observed.

Noble (R. J.) & Noble (N. S.). **Aphid vectors of the virus of woodiness or bullet disease in Passion Fruit (Passiflora edulis Tims).**—*J. roy. Soc. N.S.W.*, lxxii, pp. 293–317, 2 pl., 1 fig., 1939.

Owing chiefly to the widespread incidence of woodiness disease of passion fruit (*Passiflora edulis*) in New South Wales [*R.A.M.*, viii, p. 185; xvii, p. 730] the total yield was reduced from 73,230 bush. in 1928 to 31,550 bush. in 1937, the average yield per vine declining from 0·43 to 0·18 bush.

Of all the diseases affecting this host locally woodiness is the most serious. Fruits on infected vines are sometimes stippled or blotched and may show small ring-like markings. In mild weather the terminal leaves are conspicuously curled down along the axis of the main veins. The upper surfaces of the leaf tips may press against the under surface of

the petioles or main veins, the laminae showing a cylindrical curling. Marked vein clearing occurs in these young leaves. Curling is most evident when the growth occurs at temperatures below 80° F., but puckering and mottling are the first symptoms at higher temperatures. After the development of leaf curl, and while the temperature is not over 80°, the upper leaves tend to become chlorotic, and subsequently drop. The disease temporarily checks growth, and infected plants are shorter than normal ones. Artificial inoculations gave positive results most readily in vigorously growing plants exposed to relatively high humidities and temperatures not exceeding 75°. Masking occurred at temperatures over 85°, the symptoms reappearing in the new growth at lower temperatures. Leaf malformation occasionally took the form of reduced development of the lamina, such leaves being longer and narrower than normal juvenile leaves, or sometimes showing a fern leaf appearance. No evidence was obtained of seed transmission.

In experiments on insect transmission large numbers of a dark aphid, referred to as *Aphis* sp. A, obtained from *Stizolobium* sp. were fed for five or six days on a mechanically infected passion vine, after which they were transferred to six healthy passion vines (three for each feeding period), all of which showed leaf curl symptoms in six to nine days. In a second test one out of six test plants on which infective aphids were placed developed leaf curl. In the third experiment the aphids were transferred from *Stizolobium* to healthy pre-feeder passion vines, and then part of the population to healthy passion fruit plants and another part to infected passion fruit plants, after which populations from the healthy and diseased feeder plants were transferred to healthy test plants. Six of the ten plants in the infective vector series became affected while the pre-feeder and control plants remained healthy. Transmission was also secured in outdoor experiments.

In similar tests with a dark aphid from *Cotyledon valida*, referred to as *Aphis* sp. B, (not using healthy pre-feeder plants) symptoms were secured (when the populations had been rendered infective by feeding on infected vines) six to eleven days after transfer to the healthy plants. Tests with single aphids gave typical symptoms on 2 of 24 plants.

When populations of *Myzus persicae* from sprouting potatoes were transferred to healthy passion vines after feeding for one to three days on mechanically infected vines, positive results were obtained in 7 to 11 days. Further evidence showed that symptoms arose only from vectors that became infective after feeding on diseased vines. With single aphids the virus was transferred to 3 of 25 plants.

In tests with *Macrosiphum solanifolii* aphid populations transferred from diseased to healthy vines gave leaf curl symptoms on two out of four plants. When bulk populations, healthy pre-feeder, and healthy and diseased feeder plants were used three of the five test plants in the infective vector series developed the leaf curl symptom. In an outdoor test, first symptoms were observed ten days after transfer of presumably infective aphids to the test plants.

Insects other than aphids were not found capable of transmission. Under field conditions it is possible that in New South Wales *Myzus persicae* is the chief vector.

Some growers have obtained satisfactory control by improved

sanitary measures, including planting only healthy seedlings, removing affected young plants, and completely eradicating diseased plantations before replanting. As the vines are visited by aphids only at infrequent intervals, the adoption of aphicidal measures at appropriate periods may prove economically feasible and of value in control.

[A short account of this work appears in *Agric. Gaz., N.S.W.*, l, 1, pp. 19–21, 1939.]

Sattar (A.) & Malik (S. A.). **Some studies on anthracnose of Mango caused by Glomerella cingulata Stonem. (S. & v. S.) (Colletotrichum gloeosporioides Penz.) in the Punjab.**—*Indian J. agric. Sci.*, ix, 3, pp. 511–521, 2 pl. (1 col.), 2 graphs, 1939.

Anthracnose of mango, caused by *Colletotrichum gloeosporioides* (the conidial stage of *Glomerella cingulata*) [*R.A.M.*, xvii, p. 761], is reported from several districts in the Punjab, where the disease attacks the leaves, twigs, and fruits. On the leaves it forms numerous oval or irregular brown spots, sometimes extending to elongated necrotic areas. When the petioles are affected the leaves droop and ultimately fall. On the twigs black necrotic areas develop from the tips downwards causing a die-back. In a cultural study the fungus was found to grow best on most media at temperatures between 25° and 29° C. (the minimum temperature for growth being between 10° and 15° and the maximum between 35° and 40°); the optimum hydrogen-ion concentration was P_H 6·9, but fairly good growth was obtained from P_H 4 to 9. Inoculation experiments were successful on leaves, petioles, stems, and fruits, the optimum temperature for infection being 25°. Under experimental conditions in the open at Lyallpur, the disease perennated in the detached diseased twigs and leaves lying on the surface of the soil and in the diseased twigs attached to the trees. Trials conducted at Multan showed that the disease can be effectively controlled by destroying all potential sources of infection (namely, diseased leaves and twigs lying on the soil, and diseased prunings) and by spraying young grafted mango trees with 3–3–50 Bordeaux mixture in February, March, and September.

Thomas (K. M.) & Krishnaswami (C. S.). **Leaf crinkle—a transmissible disease of Papaya.**—*Curr. Sci.*, viii, 7, p. 316, 1 fig., 1939.

Papaw seedlings in a pot culture house at Coimbatore developed an apparently new disease, termed leaf crinkle [cf. *R.A.M.*, xviii, p. 693], characterized by slightly zigzag stems, crinkled leaves with the lobes curving downwards and inwards in the shape of an inverted cup, and with thick, gnarled, dark green, opaque veins on the under side. The affected seedlings did not develop dwarfing, and exhibited the symptoms throughout growth. When pollarded, they developed characteristically affected leaves. No organism appeared to be associated with the condition. When affected seedlings were grafted by inarching on to six healthy seedlings, three of the latter developed symptoms of the condition within 120 days.

Berry (W. E.). **Spray injury studies. Progress Report I. Some observations on the probable causes of lime sulphur injury.**—*Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 124–144, [1939].

Lime-sulphur injury to apples is of two types. In the first type leaves

not fully opened may show scorching of the tips and margins, especially when frost follows the application of the spray. Fully opened leaves may develop a scorch in the form of necrotic patches generally adjoining the larger veins and occurring mainly when the spray fluid has accumulated on the leaf. In the second type, extensive defoliations may occur soon after the spray is applied without any other sign of injury. At Long Ashton the Worcester Pearmain, Laxton's Superb, Allington Pippin, and Rival varieties may be sprayed with 1½ per cent. lime-sulphur at any stage without injury, Cox's Orange Pippin, Bramley's Seedling, and Newton Wonder will stand a maximum of 1 per cent. while Lane's Prince Albert, Lord Derby, Stirling Castle, and St. Cecilia are extremely sensitive to sulphur. Tolerant and sensitive varieties are also found in currants, gooseberries, pears, and plums.

When Cox's Orange Pippin apple trees were sprayed in successive groups with 2 per cent. lime-sulphur at intervals from 7.30 a.m. to 10 p.m. on 13th June, 1938, the leaf fall caused by the spraying during the next five days was found to be correlated with the temperature, humidity, and sunshine prevailing at the time of the application. Maximum fall occurred as a result of the spray given at 5.30 p.m. when temperature was high, humidity low, and sunshine continuous. The data supported the view that spray injury is more prevalent in sunny than cloudy conditions, and temperature appeared to be a more important factor than humidity. Scorching, which was very slight, became apparent in 7 to 10 days.

To ascertain whether a spray deposit may exert sufficient desiccating effect to cause leaf injury, Cox's Orange Pippin and Lane's Prince Albert apple trees were sprayed with 0·5 M sucrose and 0·5 M calcium chloride solutions as desiccating sprays, and 2 per cent. lime-sulphur for purposes of comparison. The applications were made on 13th June, in the afternoon. By 18th June, the total leaf fall on Cox's Orange Pippin was 17·2, 17·2, and 74 leaves per tree for the treated trees, respectively, against 18 for the unsprayed control, and on Lane's Prince Albert 90·3, 93·6, and 186 for the treatments, respectively, no controls being available.

The evidence suggests that the susceptibility of the Lane's variety to spray damage may not be confined to sulphur sensitivity. It is concluded that the damaging effect of lime-sulphur is mainly due to a specific effect of sulphur compounds on the leaf, desiccation playing a comparatively minor part.

Laboratory investigation into the effect of lime-sulphur spray on detached Lane's Prince Albert and Laxton's Superb apple leaves showed that at first the respiration rate of the sprayed leaves was higher than that of the unsprayed, but later fell below it. Leaf injury due to lime-sulphur appears to result from the direct entry of spray fluid into the cells, through intact cuticle or lesions. The view is expressed that sulphur injury of the type resulting in leaf abscission may be due to a gaseous or volatile compound, probably hydrogen sulphide.

Höfer (H.). **Praxis und Theorie der Wirkung von Kupferspritzmitteln auf Pflanzen.** [The practice and theory of the action of copper sprays on plants.]—*Angew. Bot.*, xxi, 3, pp. 261–301, 17 figs., 1939.

Reckendorfer's investigations showed that a deposit of Bordeaux

mixture undergoes decomposition through the action of atmospheric humidity and carbon dioxide [*R.A.M.*, xvi, p. 110], and further that the deleterious action of the fungicide on the tissues of certain plants is primarily due to the copper sulphate component of the compound.

In the writer's experiments at the Dresden Technical College to determine the action of 2 per cent. Bordeaux mixture on leaves of different anatomical and physiological types, the presence of soft, long hairs, as in *Sorbus* [*Pyrus*] *hybrida* and *Viburnum lantana*, or of a wax layer (*Symphoricarpos racemosus*), prevents the adhesion to the epidermis of the solution and greatly reduces its efficacy. On the other hand, the stiff, vertical hairs of *Corylus avellana* and black currant (*Ribes nigrum*) constitute no impediment to the infiltration of the spray fluid, which forms a thin crust over the epidermis and is largely protected by the hair bases against washing off.

The well-known foliar injuries associated with Bordeaux treatments appear to be peculiar to highly cultivated fruit trees and bushes, since with the exception of mild symptoms on *Pelargonium zonale*, none of the 42 plants sprayed with the mixture at concentrations of 1 to 6 per cent. sustained any damage. The susceptibility of leaves to copper sulphate injury was found to depend to some extent on the structure of the epidermis, the best defence being provided by a thick cuticle or multilaminate epidermis, as for example in holly (*Ilex aquifolia*), ivy (*Hedera helix*), box (*Buxus sempervirens*), and *Vinca minor*, which sustained no damage from a fortnight's contact with a 7 per cent. solution. A wax coating, as in peas, broad beans (*Vicia faba*), *Allium fistulosum*, sea-kale (*Crambe maritima*), and nasturtium (*Tropaeolum majus*), failed to prevent injury, except at very low concentrations, but retarded its onset, while a similar action was exerted by water tissue (*Tradescantia fluminensis*, *Begonia* spp., *Peperomia arifolia*). Plants with glabrous or pubescent leaves, the former represented by beech (*Fagus orientalis*), *Magnolia speciosa*, gooseberry, and five other species, and the latter, e.g., by soy-bean, *Cucurbita maxima*, and *Pyrus eleagnifolia*, showed almost equal susceptibility to scorching. The individual tissues were found to differ in their reactions to the fungicide, the most sensitive (in the order given) being the lower and upper epidermis, collenchyma, sclerenchyma, vessels, sieve-tubes, spongy, cortical, and assimilatory parenchyma, and cambium [ibid., xv, p. 36]. The copper sulphate was shown by anatomical examination to exert an injurious stimulus, not confined to the immediately affected tissues, but involving the adjacent areas.

Not even by means of X-rays was it possible to detect the actual presence of copper in the damaged tissues, the observed detrimental effects on which are evidently produced by infinitesimal and imperceptible amounts of the mineral. In experiments on soy-beans, the absorption of lithium chloride by the leaves without damage was spectroscopically demonstrated, the under side of the leaf apparently being the chief site of entry, and it is considered probable that copper is similarly taken up. By means of adjustments of the prevailing humidity (soil and atmospheric), temperature, and atmospheric stillness or motion it was possible to induce rapid changes in the osmotic values of *C. maxima* and *Coleus*, pointing, according to Menzel [loc. cit.] to corre-

sponding modifications in susceptibility to copper injury, but experimental proof of this hypothesis is not yet forthcoming. The physiological condition of the sprayed plants would appear to be the governing factor in their reaction to contact with the copper salts, though naturally the individual anatomical features must also be studied in relation to the phenomenon under discussion.

Maier (W.). **Die durch Regen an blaugespritzten Obstbäumen gelösten Kupfermengen und ihre fungizide Wirksamkeit.** [The quantities of copper washed off 'blue'-sprayed fruit trees by rain and their fungicidal efficacy.]—*Angew. Bot.*, xxi, 3, pp. 302–307, 1 graph, 1939.

The result of the writer's experiments on the dissolution by rain of the copper on pear trees treated by the 'blue' method against *Venturia pirina* at the Geisenheim (Rhine) Research Institute, and the relation of this process to the efficacy of the treatment have already been described from another source [*R.A.M.*, xviii, p. 462].

Pryor (D. E.) & Walker (J. C.). **A method for testing the toxicity of volatile compounds.**—*Phytopathology*, xxix, 7, pp. 641–643, 1 fig., 1939.

An improved method for testing the toxicity of volatile compounds in the vapour phase is described in which a minimum of special glassware is required. The containers are Petri dishes sealed with parafilm or glass-top fruit jars. The fungus culture is placed on an agar film deposited upon the inside of the cover. The films must be uniform in diameter and thickness to avoid a differential in the rate of absorption of the volatile substance placed in the bottom of the container. The film, therefore, is made by pouring agar on to a specially constructed glass plate covered with a sheet of glass supported on pieces of glass within a transfer chamber, and from the film 2 in. disks are cut with a 'biscuit cutter' and transferred to the containers with a sterile spatula.

Wilcoxon (F.) & McCallan (S. E. A.). **Theoretical principles underlying laboratory toxicity tests of fungicides.**—*Contr. Boyce Thompson Inst.*, x, 3, pp. 329–338, 3 graphs, 1939.

Toxicity experiments are stated to be of two types, those in which some property of each individual such as germ-tube length or diameter of colonies, is measured quantitatively, and those in which the individuals are divided into two categories, such as germinated and non-germinated spores. Toxicity curves obtained by the second method result from the possession by each individual spore of its own particular lethal dose, there being a distribution of individual lethal doses which tends to be symmetrical when plotted against the logarithm of the concentration of the toxic agent. Two rapid, approximate methods of deducing the properties of the curve of individual lethal doses from the toxicity data obtained are described. One involves plotting the percentage of viable spores failing to germinate against the logarithm of the concentration, using semi-logarithmic paper if desired. The other involves the use of logarithmic probability paper, the percentages of spores failing to germinate being plotted on the vertical axis against the corresponding

concentrations on the horizontal axis; the best straight line is then drawn through the points giving the greatest weight to points in the neighbourhood of 50 per cent. From these graphs the LD 50 value, i.e., the concentration preventing 50 per cent. germination [*R.A.M.*, xvii, p. 540] may be estimated [by a method which is described], and the range within which it may be expected to lie 19 times out of 20. The methods may be extended to estimate LD 95 and its corresponding zone of error.

When it is necessary to compare fungicides run at different times or in different laboratories, they should be rated in terms of a standard fungicide run at the same time.

CHIARUGI (A.). **L'eredità in patologia vegetale.** [Heredity in plant pathology.]—*Relaz. IV. Congr. int. Pat. comp., 1939*, pp. 155–210, 1939. [German, English, Spanish, and French summaries.]

In this paper the author discusses in some detail the available information on hereditary factors causing disease in plants. These may have a direct or indirect function, the former resulting from a change in the genic balance which may be permanent or temporary, and the latter involving the segregation of specific genes determining resistance. The paper concludes with a discussion of the theory of genetic centres of cultivated plants.

NĚMEC (B.), PETRI (L.), & QUANJER [(H. M.)]. **Regressive changes in plants.**—*Relaz. IV Congr. int. Pat. comp., 1939*, pp. 443–515, 1939. [English, Spanish, French, and Italian summaries.]

The three authors make individual contributions to this symposium on regressive changes in plants resulting from natural or pathological causes. The field covered is wide and various theories are advanced to explain the observed changes in plant tissues and individual cells. Petri's contribution (pp. 459–507) concludes with a bibliography of approximately 250 titles.

AINSWORTH (G. C.). **Agreement to use the fungus binomials recommended in the List of Common Names of British Plant Diseases.**—*Trans. Brit. mycol. Soc.*, xxiii, 3, pp. 271–272, 1939.

In his capacity as Secretary of the Plant Pathology Committee of the British Mycological Society G. C. Ainsworth announces that 42 Offices, Societies, and Institutes in the United Kingdom have agreed to use the fungus binomials recommended in the 'List of common names of British plant diseases' [*R.A.M.*, xiv, p. 325; xv, p. 467] in their official publications. Arrangements have been made to have the List revised more frequently, and for any necessary emendations to be published in the *Trans. Brit. mycol. Soc.* or in new editions. Every effort has been made to ensure that the fungus names included in the List conform to the International Rules of Botanical Nomenclature and it is hoped, therefore, that the binomials recommended may constitute, within the British Isles, a standard list of names of the more important fungus parasites.

WAKEFIELD (E[LSIE] M.). **Nomina generica conservanda. Contributions from the Nomenclature Committee of the British Mycological Society. I.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 215–232, 1939.

The preparation and publication by the Plant Pathology Committee of the British Mycological Society of the 'List of common names of British plant diseases' convinced the Committee of the urgent need for international agreement about the conservation of generic names which are in common use but are not in accordance with the International Rules of Botanical Nomenclature. For this reason the Council of the British Mycological Society appointed a Committee, under the chairmanship of E. W. Mason and with Miss E. M. Wakefield as secretary, for the investigation of problems of nomenclature with a view to making some proposals before the next International Botanical Congress, which is expected to meet at Stockholm in 1940. In order to co-ordinate the material which is prerequisite for solving the most urgent problems of nomenclature, this Committee has prepared statements of the cases for and against the conservation of 14 names. The statements in this first contribution deal, *inter alia*, with the following genera: *Guignardia* Viala & Ravaz (1892) versus *Carlia* Bon. (1864) (nec Rabenhorst (1857)); *Sphaerella* (Fr.) Rabenh. (1856) versus *Sphaerella* Ces. & de Not. (1863), emend. Sacc. (1875), *Sphaerella* Sommerf. (1824), *Carlia* Rabenh. (1857), and *Mycosphaerella* Johans. (1884); *Uromyces* Link (1816) versus *Nigredo* Roussel (1806), *Caeomurus* (Link) S. F. Gray (1821), and *Puccíniola* Marchand (1829); *Urocystis* Rabenh. (1856) versus *Tuburcinia* Fr. (1832) [see next abstract]; *Hypochnus* Fr. (1829), emend. Schroet. (1889) versus *Lyomyces* Karst. (1881); *Poria* (Fr.) Karst. (1881) versus *Physisporus* Gillet (1874–7); *Tubercularia* Fr. (1829) versus *Tubercularia* Wiggers (1780), and *Knyaria* O. Kuntze (1891).

Urocystis versus Tuburcinia.—*Trans. Brit. mycol. Soc.*, xxiii, 2, p. 214, 1939.

The proposal of the Plant Pathology Committee of the British Mycological Society to conserve the name *Urocystis* Rabenh. (1856) against the name *Tuburcinia* Fr. (1832) [see preceding abstract] is based on the following grounds. (1) The name *Urocystis* has been well known to, and much used by, plant pathologists, and should not be discarded without cogent reasons; (2) the disuse of the name *Urocystis* is not dictated by the accession of any new knowledge, as *Tuburcinia orobanches* has been accepted as a species of *Urocystis* since 1877, when it was renamed *U. orobanches*; and (3) since 1877 the generic name *Tuburcinia* Fr. has been used in a rather different sense, as if it were founded on *T. trientalis* Berk. & Br., a species unknown to Fries; it is still a matter of taxonomic dispute whether species of *Tuburcinia* so used are properly classified in the same genus with the species of *Urocystis*. It is strongly urged that it is not in the interests of plant pathology that major pathogens such as *U. occulta*, *U. tritici*, and *U. cepulae* should be dispossessed of their well-known generic names for the sake of a less known one, the use of which since 1877 is open to suspicion. [Data regarding these two genera are fully set forth in the paper noticed in the preceding abstract.]

Bawden (F. C.). **Plant viruses and virus diseases.**—272 pp., 1 pl., 30 figs., 3 diags., 6 graphs, Leiden, Holland, The Chronica Botanica Company, 1939. 7 guilders.

'This is not . . . a text-book of virus diseases. Detailed descriptions of symptoms and host-ranges are not given, but all other aspects of the subject are treated' (author's preface). Following a brief historical introduction, two chapters are devoted to symptomatology, one to transmission and properties of viruses in expressed sap, and another to a discussion of the mechanism of insect-transmission and the relationship between viruses and their vectors. Chapter 6 deals with variation and acquired immunity. After a concise summary of serology in relation to plant viruses [*R.A.M.*, xviii, p. 540] three chapters are assigned to topics with which the author has been intimately concerned, viz., the purification of viruses and their chemical, physical, and optical properties. Methods of determining the sizes of virus particles are indicated and the evidence leading to the conclusion that the nucleo-proteins are the viruses themselves is critically discussed. The physiology of virus-diseased plants has been allotted one chapter. After notes on classification and control measures, the book concludes with a discussion on the origin and multiplication of viruses. There is an adequate index. This book, which provides a valuable summary of a large and scattered literature, should be accessible to all those interested in plant viruses.

Stanley (W. M.) & Loring (H. S.). **Properties of purified viruses.**—*Relaz. IV Congr. int. Pat. comp., 1939*, pp. 45–87, 5 figs., 5 graphs, 1939. [German, Spanish, French, and Italian summaries.]

The authors critically review the present state of knowledge regarding the comparative properties of virus proteins [cf. *R.A.M.*, xvii, p. 846; xviii, p. 212] and conclude that the several virus proteins are in fact the viruses themselves, and that virus activity must, therefore, be considered in terms of these proteins. The paper concludes with a discussion of a precursor-autocatalytic hypothesis and an alternative hypothesis of viruses as a type of living agent with an intra- rather than an intermolecular structure. [This report is a slightly expanded version of the same authors' 'Properties of Virus Proteins', *Cold Spring Harbour Symp. Quant. Biol.*, vi, pp. 341–355, 1938.]

Giddings (N. J.). **A small cage for insect vectors used in plant inoculations.**—*Phytopathology*, xxix, 7, p. 649, 1 fig., 1939.

A description is given of a glass insect-container for inoculating plants by means of insect vectors which obviates the use of perishable rubber bands and unsatisfactory spring clips. It consists of a piece of glass tubing 22 mm. in diameter and 22 mm. high, a cloth cover, a grooved square of ground glass, a top bar, and two coil springs. The springs are attached to the bar and the glass square to hold the tubing inserted between them in position.

Baldacci (E.). **Ricerche sull' immunità acquisita in organi isolati e nei tessuti vegetati 'in vitro'.** [Researches on acquired immunity in

detached organs and in plant tissues *in vitro*.]—*Phytopath. Z.*, xii, 3, pp. 277–282, 3 figs., 1939.

This is an expanded account of the writer's experiments at the Pavia Agricultural Experiment Station, a preliminary note on which has already appeared [*R.A.M.*, xviii, p. 543], on the immunization by 'vaccination' of red clover (*T*[*rifolium*] *pratense*) leaves against *Macrosporium commune* [? *Stemphylium botryosum*: ibid., xviii, p. 141] and *Rhizoctonia solani* var. *ambigua*, and of maize roots against the latter organism.

Barthelet (J.). **La nutrition des végétaux et le parasitisme.** [Nutrition of crop plants and parasitism.]—*Ann. agron., Paris*, N.S., ix, 2, pp. 253–268, 1939.

In this paper the author reviews, with numerous references to the relevant literature, the present state of knowledge on the nutrition of crop plants in relation to susceptibility to attack by fungal and virus diseases.

Leonian (L. H.) & Lilly (V. G.). **Studies on the nutrition of fungi II. Effect of inoculum on the growth of the colony.**—*Phytopathology*, xxix, 7, pp. 592–596, 2 figs., 1939.

In experiments made to ascertain whether an inoculum exerts an influence on the growth of the ensuing colony, the authors, using thiamin (vitamin B_1) and dextrose as test substances and *Phycomyces blakesleeanus* (which cannot grow without thiamin) as the test organism, demonstrated that for all practical purposes the quality and quantity of nutrients and auxithals present in the agar of an inoculum have no significant influence on the initiation and growth of the new colony.

Been (W. G.). **Incidence of Potato leafroll on Long Island.**—*Plant Dis. Reptr*, xxiii, 13, p. 219, 1939. [Mimeographed.]

Evidence obtained during a survey by K. H. Fernow, H. S. Cunningham, and the writer of over 200 potato fields on 74 farms on Long Island proved conclusively that the cause of the condition known locally as 'hairsprout' [*R.A.M.*, xvii, p. 701] is leaf roll.

Pethybridge (G. H.). **History and connotation of the term 'Blattrollkrankheit' (leaf-roll-disease) as applied to certain Potato diseases.**—*Phytopath. Z.*, xii, 3, pp. 283–291, 1939.

The author traces the history of the term 'leaf roll disease', introduced into phytopathological literature in 1906 by O. Appel (*Jb. Ver. angew. Bot.*, iii, p. 122) for a disease attributed to one or more species of *Fusarium*, and critically discusses its connotations in relation to certain virus and fungal diseases of potatoes. Some outstanding studies on the subject are briefly summarized, special credit being given to Quanjer and his associates in Holland for their recognition of phloem necrosis as the underlying cause of leaf roll. 'Blattrollkrankheit' is still the accepted name for phloem necrosis of virus origin of the potato in Germany, where it is clearly differentiated, however, from the *Fusarium* and *Verticillium* wilts to which the same term was formerly applied.

JAHNEL (H.). **Wuchsstoffuntersuchungen an abbaukranken Kartoffeln. II.** [Auxin investigations on degenerate Potatoes. II.]—*Phytopath. Z.*, xii, 3, pp. 312–317, 1939.

Continuing his studies at the Botanical Institute of the Tharandt (Saxony) College of Forestry on the relation of the auxin content of Parnassia, Odenwälder Blaue, and Direktor Johanssen potato tubers to their state of health [*R.A.M.*, xvi, p. 706], the writer confirmed his previous observations both as to the larger amounts present in sound material and the readier response of the latter to the application of heteroauxin to the leaf spindles. In a test consignment comprising two lots each of Odenwälder Blaue and Erstling [Duke of York], one healthy and the other diseased, the author, without knowing the diseased condition of the tubers, correctly diagnosed the diseased and healthy lots of each variety on the basis of the auxin production as follows: Osterwälder Blaue, 10·4° and 4·9° corresponding to 100 and 47 per cent., as healthy and diseased, respectively, and Duke of York, 6·4° and 5·5° corresponding to 100 and 86 per cent. as apparently healthy and apparently diseased, respectively. The percentage of diseased plants in stands grown from unused tubers of the four samples were 31·58, 100·00, 30·25, and 98·95 per cent., respectively, thereby confirming the accuracy of the diagnosis. It is apparent from these results that a close correlation exists in potato tubers between liability to virus diseases and hormone metabolism.

OWENS (C. E.). **Bacterial ring rot of Potato in Oregon.**—*Plant Dis. Reptr*, xxiii, 13, p. 223, 1939. [Mimeographed.]

Potatoes growing in eastern Oregon developed a severe outbreak of *Bacterium sepedonicum* [*R.A.M.*, xviii, p. 613] in 1939, some fields showing from 1 to 5 per cent. infection.

LEPIK (E.). **Untersuchungen über den Biochemismus der Kartoffelfäulen. II. Über die Rolle der stickstoffhaltigen Bestandteile der Kartoffelknolle bei der Phytophthora-Fäule.** [Studies on the biochemistry of the Potato rots. II. On the role of the nitrogen-containing components of the Potato tuber in *Phytophthora* rot.]—*Phytopath. Z.*, xii, 3, pp. 292–311, 6 graphs, 1939.

Continuing his studies on the biochemistry of potato blight (*Phytophthora infestans*), initiated in Switzerland [*R.A.M.*, viii, p. 596], at the Dorpat (Estonia) Phytopathological Experiment Station, on Swiss material of the Erdgold, Iris, Wekaragis, and Kaiserkrone varieties, the writer found that judged by the heavy losses of total nitrogen (amounting to 4·225 per cent. on a dry weight basis) and proteins (from 0·7 to 1·5 per cent.) in diseased as compared with healthy tubers, the nitrogen-containing components of the tuber constitute the main source of energy for the fungus.

MURPHY (P. A.). **A study of the seasonal development of the Potat plant in relation to blight attack and spraying.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxii, 6–14, pp. 69–82, 14 graphs, 1939.

Observations made in 1933, 1934, 1936, and 1937 on Up-to-Date potatoes on which *Phytophthora infestans* was perfectly controlled,

commercially controlled, and untreated demonstrated that the first result of spraying is, as a rule, to check foliage and tuber production and reduce blossoming. Hence, spraying becomes beneficial only when it reduces infection later on. In 1933, when the weather was exceptionally dry, spraying increased foliage production.

Perfect control of blight with no appreciable injury resulted from weekly applications of cuprous oxide, used for the first two treatments at a concentration of only 0·05 per cent., and for the remaining twelve at one of only 0·075 per cent., the total amount of copper used for the season being only 5½ lb., as against 12 lb. for three applications of Burgundy mixture (1, 1, and 2 per cent.) at 120 gals. per acre, which gave only commercial control.

In the disease-free crop maximum production reached 1½ tons per acre per week. This was maintained for four weeks after blossoming, and then decreased, the September production being little more than half that for August. The period of maximum tuber production roughly coincided with that of maximum foliage production, the curve for total weight of haulms forming an almost regular arc. After the unsprayed crop had become infected, the decline in haulm production followed a sigmoid course. Tuber production suddenly ceased when the haulms were reduced to 55 per cent. of their maximum weight, at which time the leaves were 30 to 40 per cent. of their maximum weight. The amount of benefit to production due to spraying depends on the duration of the interval between the arrest of production due to blight on the foliage and the arrest of production due to normal maturation.

Le Clerg (E. L.). **Methods of determination of physiologic races of Rhizoctonia solani on the basis of parasitism on several crop plants.** —*Phytopathology*, xxix, 7, pp. 609–615, 1 fig., 1939.

In investigations conducted to study the variability in pathogenicity of a number of isolates of *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xviii, p. 494] in relation to the possible identification of physiologic races damping-off experiments were made in three seasons in the greenhouse with 29 isolates of the fungus from potatoes and sugar beets, sugar beets, Detroit Dark Red table beets, and Grimm lucerne being used as possible differential hosts. The amount of damping-off that occurred was very variable for most of the isolates tested in all these experiments, as indicated by the large values of most of the coefficients of variability, though with a few isolates degree of variability was relatively small for each of the three hosts.

In more extensive experiments direct inoculations with 13 isolates from potatoes and sugar beets from widely separated localities were made on the underground stems of older plants of beans [*Phaseolus vulgaris*] (five varieties), soy-bean, peas, celery, tomato, cabbage, and carrot. With beans this method gave less variability in results between successive experiments than was the case in the damping-off experiments, but it is considered that the results with beans do not warrant identification of physiologic races, though under more favourable experimental conditions the method may become useful. None of the potato isolates was pathogenic to cabbage, while carrots appeared to be much more resistant to the potato isolates than to the sugar beet

isolates. On carrots and peas some isolates produced large or small sclerotia.

Davies (D. L. G.). **A rootstock canker of Hops caused by Gibberella pulicaris (Fr.) Sacc.**—*Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 115–123, 2 pl., [1939].

During 1938, hops in the Tenbury Wells area of Worcestershire were widely and severely affected by rootstock canker [*R.A.M.*, xvi, p. 367], the disease, which has been known since 1902 and came into prominence about three years ago, causing a total loss in many gardens. In addition to the symptoms previously described [ibid., ii, p. 132], infected hops often show pale green leaves with a mosaic-like puckering.

In the cases investigated in 1938 infection appeared to have originated at the cut ends of the 'straps' (i.e., at the bases of the bines of the previous season), and prevalence seemed to be associated with defective drainage. Infected 'straps' bore near the cut end the globose, conoid or ovoid, black perithecia of a species of *Gibberella*, arranged in irregular heaps, or scattered and solitary on a brown stroma, 0·22 to 0·42 by 0·16 to 0·3 mm., with a wall violet-blue to dark violet-blue by transmitted light and wrinkled and warted when dry. The clavate, almost sessile asci measured 73 to 105 by 12 to 15 μ, and were rounded at the apex. The obliquely uniseriate and biseriate, oblong-oval or fusoid, straight or curved, triseptate, hyaline, smooth ascospores measured 21 to 28 by 5 to 6 μ, and were slightly constricted at the septum. The fungus was identified as *G. pulicaris*. Single ascospores in culture produced the imperfect stage, *Fusarium sambucinum*. A *Fusarium* found on bines arising from the diseased straps produced in culture the perithecia of a *Gibberella* identical with those found on the diseased straps.

Experimental inoculations of the cut surface of hop runners in pots resulted in a browning of the cutting tissues extending downwards from the inoculated surface through the entire cutting. Perithecia formed on the inoculated surface. Shoots developed and wilted, and *F. sambucinum* was reisolated from the diseased material.

Notes from Sugar centres. Isis District.—*Aust. Sug. J.*, xxxi, 3, pp. 175–176, 1939.

A report on the progress up to 29th April, 1939, of the Fiji disease eradication campaign in the Isis district of Queensland [*R.A.M.*, xviii, p. 549] since the inception of intensified measures on 9th August, 1938, states that during the period under review 98 infected stools were found on 20 of the 189 farms visited, covering 4,922 acres of susceptible varieties; 136 blocks of planting material were inspected and found to be healthy. Since the present outbreak of the disease about three years ago, infection has been found on 34 farms, of which 14 would now appear to have eliminated the trouble, an encouraging indication of the successful outcome of determined efforts in this direction.

Tate (H. D.) & Vandenberg (S. R.). **Transmission of Sugar-cane mosaic by aphids.**—*J. agric. Res.*, lix, 1, pp. 73–79, 1939.

In transmission experiments conducted at Mayaguez, Puerto Rico, sugar-cane mosaic was successfully transmitted by *Carolinaia cyperi* and

Hysteroneura setariae [*R.A.M.*, xvii, p. 488], the percentages of inoculated plants becoming infected being 31·3 (60 out of 192) and 8 (11 out of 137), respectively, while *Aphis maidis*, used as a control, showed 34·5 per cent. (69 out of 200) infected plants. In most cases a considerably higher percentage of transmission was obtained on plants grown from seeds than on those grown from cuttings. *C. cyperi* is stated to occur in considerable abundance on the weed grass *Cyperus rotundus* and on a number of other grasses growing in and around sugar-cane fields throughout Puerto Rico. None of the three aphids feeds to any appreciable extent on sugar-cane in Puerto Rico, with the exception of localized infestations of *H. setariae*, and it appears that field dissemination of the disease is largely dependent upon insects that are more or less incidentally associated with sugar-cane.

Bisby (G. R.). **Trichoderma viride Pers. ex Fries, and notes on Hypocrea.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 149–168, 5 figs., 1939.

In the light of an exhaustive study of specimens from herbaria and the field and numerous cultures, *Trichoderma viride* [*R.A.M.*, xviii, p. 295], the conidial stage of *Hypocrea rufa* (as confirmed by one mono-ascospore isolation), is considered to be a very variable species, particularly in the shape of the conidia, which are subglobose in some isolations and ovoid in others; the same variation is also found in the shape of the ascospores. A revised description is given and the species is made to include the following synonyms: *T. lignorum*, *Acrostalagmus viridis*, *T. koningi* [ibid., xviii, p. 485], *Eidamia viridescens* [ibid., xvi, p. 150], *Sporotrichum narcissi* [ibid., xiii, p. 796], *T. narcissi*, *A. koningi*, *T. nunbergii* [ibid., xi, p. 757], and *T. viridescens*. The author expresses the view that the genus *Trichoderma* is monotypic, other names in it requiring further examination. From the description *T. glaucum* is regarded as *T. viride* in the yellowish condition induced by an alkaline medium. *T. viride* was also obtained from ascospores of a specimen of *Hypocrea gelatinosa* and it is suggested that *H. gelatinosa* is only mature *H. rufa*. *H. pulvinata* produced in culture a conidial stage considered to belong to *Cephalosporium*; it is homothallic, and readily formed ascospores.

Groves (J. W.). **Some Pezicula species and their conidial stages.**—*Canad. J. Res.*, Sect. C., xvii, 5, pp. 125–143, 4 figs., 1939.

Descriptions are given of five species of *Pezicula* [see next abstract] and their conidial stages, the genetic connexion of which was established by cultures, viz., *P. carpinea* on *Carpinus caroliniana*, and its conidial stage *Cryptosporiopsis fasciculata*, *P. pruinosa* on *Amelanchier* (conidial stage, *Sphaeronema pruinosum* [*R.A.M.*, xv, p. 117]), *P. corni* on *Cornus* (conidial stage, *C. cornina*), *P. rubi* on *Rubus* (conidial stage, *Discosporiella phaeosora*), and *P. hamamelidis* n. sp. [of which a Latin diagnosis is given] on *Hamamelis virginiana*, with its conidial stage, *C.* sp. In culture the conidial stages, while retaining some of the characters as found in nature, tended to show a common form, consisting of a globose stroma with one or more cavities. The conidial spore itself remained somewhat constantly oblong-ellipsoid. In this group the form of the spore may, therefore, be more important in indicating relationships than that of the stroma.

Wollenweber (H. W.). **Diskomyzetenstudien (Pezicula Tul. and Ocellaria Tul.).** [Studies on Discomycetes (*Pezicula* Tul. and *Ocellaria* Tul.).]—*Arb. biol. Anst.* (*Reichsanst.*) *Berl.*, xxii, 4, pp. 521–570, 9 figs., 1939.

On the basis of exhaustive studies at the Biological Institute, Dahlem, Berlin, of field material, exsiccata, and pure cultures the author gives amended descriptions of nine species of *Pezicula* [see preceding abstract], viz., *P. livida*, *P. rubi*, *P. plantarium* n. sp., *P. cinnamomea*, *P. pruinosa*, *P. carpinea*, *P. frangulae*, *P. crataegi* (syn. *P. corticola*, the ascigerous stage of *Myxosporium corticola*) [*R.A.M.*, xv, p. 468], *P. malicorticis* (Jackson) Nannfeldt (syn. *Neofabraea malicorticis*), and *Ocellaria ocellata*, a key for the determination of the species being furnished. The conidial stages of the fungi under discussion were all found to belong to *Cryptosporiopsis* Bub. & Kab. sensu extenso: a key is provided for their identification in the absence of the perfect forms. The generic conception of *Cryptosporiopsis* is discussed in relation to a number of other related genera, with special reference to the consideration of their pycnidial and spore septation characters for the avoidance of ambiguities of classification. The author considers that *Gloeosporium perennans* is the conidial stage of an unknown *Pezicula* and renames it *C. perennans* n. comb.

In inoculation experiments on Ananas and Coulon Renette and Baumann's apples and on quinces a definite rot, advancing similarly to that produced by *Phacidiella discolor* [ibid., xvi, p. 690] and rather more slowly than the decay due to *Diplodia pseudodiplodia* [*Physalospora obtusa*], was caused by *Pezicula livida* from pine, *P. cinnamomea* from oak, *P. frangulae* from *Rhamnus frangula*, *P. malicorticis* from *Pyrus* [*malus*], and *P. plantarium* from sweet cherry [ibid., xviii, p. 507]. The last-named [which is supplied with a Latin diagnosis] is characterized by dark olivaceous, spherical or oval to conical or sinuous pycnidia, 0·2 to 0·6 mm. in diameter (average 0·38 mm.), with ovoid to oblong, cylindrical, mostly straight, 1- to 7- (usually tri-) septate pycnospores, measuring 18 to 60 by 9 to 18 μ (mostly 27 to 50 by 11 to 15 μ) and extruded in white to isabelline or cream-coloured drops or cirrhi; elongated, turbinate to truncate, orange, erumpent apothecia, 0·7 to 2 by 0·5 to 2·4 (0·9 to 1·3 by 0·6 to 1·7) mm., with stalks 0·4 to 1 by 0·2 to 0·8 (0·8 by 0·5) mm., filiform paraphyses, and clavate asci, 65 to 200 by 15 to 26) (110 to 160 by 17 to 23) μ, containing eight (rarely four or six) yellowish-white to cream-coloured, fusoid to reniform, 1- to 7- (mostly tri-) septate ascospores, 15 to 37 by 6 to 11 (19 to 31 by 7 to 9) μ. Both asco- and pycnospores may give rise on germination to a few evanescent, rod-shaped spermatia, 3 to 10 by 1·2 to 3 (4 to 7 by 1·4 to 2) μ, produced directly on the membrane or borne on short sterigmata. Negative results were given in tests with *P. carpinea*, *P. crataegi*, and *O. ocellata*, while *P. rubi* and *P. pruinosa*, being represented only by herbarium specimens, could not be included in the trials.

Konstantinia-Sulidu (Aekaterini). **Parasitische Pilze Mazedoniens.** [Parasitic fungi of Macedonia.]—*Hedwigia*, lxxviii, 5–6, pp. 284–298, 1939.

This is an annotated list of some 175 parasitic fungi collected on

various cultivated and wild hosts in the vicinity of Salonika and other parts of Macedonia (Greece).

Tcheremissinoff (N. A.). Грибы, собранные в Хреновском государственном степном заповеднике. [Fungi collected in the Khrenovoy Steppe State Reservation.]—*Тр. Воронежск. Госуд. Унив.* [*Trans. Voronezh St. Univ.*], x, 5, pp. 7–15, 1939. [English summary.]

This is a list of 118 fungi, chiefly powdery mildews and rusts, collected during excursions in the summers of 1936 and 1937 in the Khrenovoy Steppe State Reservation in the Voronezh district of the U.S.S.R.

Kausche (G. A.), Guggisberg (H.), & Wissler (A.). **Quantitative Untersuchung der Strömungsdoppelbrechung von Tabakmosaik und Kartoffel-X-Virus.** [The quantitative investigation of the double refraction of flow of the Tobacco mosaic and Potato X-viruses.]—*Naturwissenschaften*, xxvii, 18, pp. 303–304, 3 graphs, 1939.

At the Biological Institute, Dahlem, Berlin, the variation of the extinction angle of a solution of tobacco mosaic virus with the streaming gradient was determined and compared with those of aqueous colloidal methylcellulose and sodium thymonucleate (molecular weights 38, 100, and 7×10^6, respectively). The resultant data indicate that individual virus particles have a very high molecular weight, running into many millions [*R.A.M.*, xviii, p. 714]. The extent of positive double refraction of the virus solution obeys the laws of ideal dilute solutions. For each streaming gradient the optical anisotropy is proportional to the concentration of tobacco mosaic virus over the range 0·0004 to 0·002 gm. per c.c. The extinction angle curve is unaffected by concentration. Probably no dissociation or variation in form of the virus particles takes place on dilution of the solution. The determination of double refraction can be used to ascertain the concentration even of very dilute virus solutions. Solutions of the potato virus X showed essentially the same double refraction properties as tobacco mosaic, but the orientation of the presumably much more slender particles is less complete.

Valleau (W. D.). **Symptoms of yellow ring spot and longevity of the virus in Tobacco seed.**—*Phytopathology*, xxix, 6, pp. 549–551, 1939.

Seedlings derived from seed of a yellow ring-spot tobacco plant [*R.A.M.*, xv, p. 831] at the Kentucky Agricultural Experiment Station developed chlorosis but seldom showed the ring or line patterns characteristic of the disease. These were obtained, however, on plants inoculated with the juice from the chlorotic seedlings. Under natural conditions, therefore, ring spot may persist indefinitely from one plant generation to another without the production of any of the patterns commonly regarded as typical of the disease, these being inoculative and invasive symptoms manifest only after the virus has entered the growing point and become truly systemic. At this stage the yellowing strain induces partial foliar bleaching, sometimes accompanied by marginal necrosis, the latter being the chief feature of infection by the green strains, which under certain conditions may also induce slight darkening and stunting of the plants. In one test on the longevity of the yellow

ring-spot virus in Turkish tobacco seed, the percentage of transmission declined from 12·1 at harvest to 0 after 1,841 days. In another experiment with six lots of seed the virus withstood 5½ years of storage.

Johnson (E. M.). **Destructive epidemic of bacterial leaf spots in Kentucky.**—*Plant Dis. Reptr*, xxiii, 11, pp. 192–193, 1939. [Mimeographed.]

A survey of the Western Kentucky tobacco seed-beds in 1939 revealed the presence of angular leaf spot (*Bacterium angulatum*) and wildfire (*Bact. tabacum*) [*R.A.M.*, xviii, p. 576] on 21st and 25th April, respectively. Both diseases, especially the latter, subsequently assumed a destructive character in areas to which liquid Bordeaux treatments were not applied, up to 75 per cent. of the stands being killed by the wet-rot stage. Out of a total of 207 Bordeaux-treated beds inspected in three counties only two were diseased (the organisms being already present at the time of application), whereas of 279 untreated beds 79 were attacked by wildfire and 86 by angular leaf spot.

Reid (J. J.), Farrell (M. A.), & Haley (D. E.). **Bacterial leaf spot diseases.**—*Science*, N.S., lxxxix, 2320, pp. 566–567, 1939.

In investigations at the Pennsylvania Agricultural Experiment Station, evidence has been obtained that *Phytomonas tabaca* [*Bacterium tabacum*] is a transitory physiological adaptation of *Pseudomonas fluorescens* [*R.A.M.*, xviii, p. 553], a species which occurs abundantly in various physiological adaptations on normal tobacco. All Pennsylvania cigar-leaf tobacco is exposed to it throughout growth and ripening but infection in the field only takes place under conditions of unsatisfactory nutrition.

Relative virulence varied widely with the source of the isolation of *P. fluorescens*, and distinct physiological characteristics were typical of the different isolates. Increase and decrease of virulence were readily induced in the laboratory. Serologically, virulence appeared to be associated with the specific nature and amount of the capsular material of the cell. Other factors being equal, the most virulent adaptations are unable to cause economic loss in plants adequately nourished.

Tobacco of the cigar-filler type is strongly resistant to infection during the growing period. At maturity, the leaves usually contain between 3 and 4 per cent. nitrogen and between 4 and 5 per cent. potassium. It is not the exact nitrogen level, but the ratio of nitrogen to certain minerals within the plant that is important in determining resistance or susceptibility, the stage during which high nitrogen uptake occurs also being an extremely important factor. Accumulation of more nitrogen than potassium induces susceptibility. Potassium is the element most needed to promote resistance, and appears to be the one most frequently deficient in Pennsylvania.

It is during the ripening period that faulty agricultural practices induce the greatest susceptibility. Whatever the nutrition of the plant previously, the uptake of significant amounts of nitrogen during ripening appreciably lowers resistance. Practices inducing severe outbreaks are (in descending order of importance): the incorporation of large amounts of organic nitrogen in the soil, the use of excessive nitrogen and in-

sufficient potash in fertilizer treatments, over-liming, and poor tilth. Practices tending to produce resistant plants of high quality and good yield are: rotation, liberal dressings of well-rotted manure, applications of a well-balanced fertilizer containing less organic than inorganic nitrogen, and suitable cultural methods.

Van Der Meer Mohr (J. C.). **Verslag van het Deli Proefstation over het jaar 1938.** [Report of the Deli Experiment Station for the year 1938.]—*Meded. Deli-Proefst.*, Ser. 3, iii, 38 pp., 1939.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xvii, p. 777]. On many estates there were two distinct periods of tobacco leaf spot (*Cercospora nicotianae*) development, one mainly involving the first sand leaves and causing relatively little damage, and the second, after a month's quiescence, characterized by severe infection, especially of the fermenting foliage. The field spotting is white and that developing in the curing barn green.

The average incidence of slime disease (*Bacterium solanacearum*) [ibid., xviii, pp. 481, 554] was 11·6 per cent. compared with 10·7 in the previous year. The number of seed-beds ploughed up on account of the disease was 52,966 (57,604 in 1937).

The American recommendation of trisodium phosphate for the disinfection of the coolies' hands to prevent mosaic transmission is fully endorsed [ibid., xviii, p. 554]. The compound is used at a strength of 8 per cent. with 4 per cent. sodium soap. Less effective than the foregoing, but useful where trisodium phosphate is unobtainable, is a mixture of 10 per cent. soda and 4 per cent. soap. No doubt the toxicity of these salts to the virus is a function of their strongly alkaline reactions (P_H 12·5 for trisodium phosphate and 11·2 for soda).

Pseudo peh-sim or false mosaic [ibid., xvii, p. 777] was very troublesome in places, 60 per cent. of the plants in one section having been unfit for plucking. The disorder, in the transmission of which Aleyrodidae are suspected, was specially prevalent in scantily irrigated fields.

There was a noticeable decrease in the extent of infection by *Phytophthora parasitica* var. *nicotianae* [ibid., xviii, p. 554], which necessitated the ploughing-up of only 664 beds as compared with 1,310 in 1937.

Notes are given on a number of other diseases of less widespread importance than those already mentioned.

Blood (H. L.) & Christiansen (R. M.). **The Utah Tomato disease situation in 1938.**—*Plant Dis. Reptr*, xxiii, 10, pp. 165–169, 1939. [Mimeographed.]

In these notes on diseases of the Utah tomato crop it is stated that bacterial canker (*Aplanobacter michiganense*) caused more damage (7·6 per cent.) in 1938 than in any year since the adoption of fermentation during seed extraction [*R.A.M.*, xiv, p. 682] or acetic acid seed treatment for the control of the disease [ibid., xvii, p. 79]. Infection predominated in home-grown plants, certain fields among the 280 acres planted with which showed up to 100 per cent., with an average for the total area of 14·2, the corresponding figures for the 282·5 acres supplied with plants from the Moapa Valley, Nevada, being 16 and 1·5 per cent., respectively. The seed for planting both the Moapa Valley and the

local seed-beds came from the same source, and it is therefore concluded that the local beds were responsible for the major portion of the infection.

Bohn (G. W.) & Tucker (C. M.). **Immunity to Fusarium wilt in the Tomato.**—*Science*, N.S., lxxxix, 2322, pp. 603–604, 1939.

Greenhouse and field tests with tomato varieties reputedly resistant to *Fusarium bulbigenum* var. *lycopersici* [*R.A.M.*, xviii, p. 557] showed that under conditions strongly favouring infection practically all the varieties became diseased. When numerous accessions of *Lycopersicum* and related genera were exposed to infection by virulent isolates of the fungus, all species in genera other than *Lycopersicum* remained immune. Accessions of *L. esculentum* were all susceptible. One strain of *L. pimpinellifolium* was very susceptible, several were resistant, and one, No. 160, remained immune under conditions highly favouring infection, even an injection of a suspension of a virulent isolate into the stems failing to produce the disease.

Tests of thousands of plants in various progenies from crosses between Accession 160 and susceptible commercial varieties proved that immunity to the fungus in tomatoes depends on a single, dominant genetic factor. The factor for immunity was maintained in the heterozygous condition in a series of four back-crosses to susceptible varieties. Its potency was not reduced in the fourth back-crosses or their progenies. Large fruit size and other commercially valuable qualities were obtained in some plants of advanced generations, and many of the plants were indistinguishable from large-fruited forms of *L. esculentum*. Although they were heterozygous for many factors affecting fruit and plant characters, some plants in progenies from self-pollinated flowers of selections derived through out-crossing immune selections to commercial varieties for four generations were homozygous for immunity.

Weber (G. F.). **Nailhead spot of Tomato caused by Alternaria tomato (Cke) n. comb.**—*Bull. Fla agric. Exp. Sta.* 332, 54 pp., 19 figs., 1939.

Nailhead spot of tomato, first reported in Florida in 1913, reached the zenith of destructiveness in 1923–4, causing a loss of 50 per cent. of the crop in that State for these two seasons. Since 1925 it has become less prevalent until at the present time it is as unimportant as in 1914. The reason for this marked reduction of the disease is partly the almost universal cultivation of the resistant Marglobe variety. The disease also caused losses estimated at $1,000,000 in Mexico in 1927 and occurs in Cuba, the West Indies, and probably in Central American countries. A complete description is given of the symptoms of the disease, with special emphasis on the characters distinguishing it from other diseases with which it has been confused, such as blossom-end rot [*R.A.M.*, xviii, p. 637] (following Galloway's misinterpretation of Cooke's description). A comparison of specimens of nailhead spot with Cooke's type material left no doubt of the identity of the Florida disease. The causal fungus, originally named *Macrosporium tomato* Cooke, is renamed by the author *Alternaria tomato* n. comb. [cf. ibid., xiii, p. 809], since he regards the names *A. tomato* (Cooke) Jones and *A. tomato* (Cooke) Brinkman [ibid., x, p. 767] as based on misidentifications [but see Art. B. 54 of the Inter-

national Rules of Botanical Nomenclature which validates Jones's name: ibid., xvi, p. 482].

Grown at room temperature on 2 per cent. potato dextrose agar the fungus produces after several days a characteristic crystalline substance, probably an alkaloid-glucoside combination closely related to solanin, the crystals developing from focal points and spreading fan-shaped in all directions. The optimum temperature for the growth of the fungus in culture was between 24° and 27° C., no growth developing at or below 5° and at or above 34°. The fungus grew at hydrogen-ion concentrations ranging from P_H 3·3 to 9, the optimum being on the alkaline side just past neutrality. In inoculation experiments in the greenhouse the host range of the fungus was extended to include horse nettle (*Solanum carolinense*), eggplant, and potatoes; in another test the most resistant of all tomato varieties was Marvel, followed by Marglobe, Globe, Cooper's Special, Magnus, Dwarf Champion, John Baer, and Earliana, the two last-named being very susceptible. Young tomatoes were more susceptible than older ones, but 'mature green' fruits (with smooth and glossy skin) are no longer attacked.

The fungus was found to remain viable on diseased foliage and stems from one season to the next; it may also survive on fruit skins left in the field after picking. Conidia are produced in abundance throughout the growing period of the host and are spread by wind, rain, running water, cultivators, and pickers. Infection may take place at any time when conditions are favourable (at temperatures of 15° to 30° and comparatively high humidity). The incubation period varies from three to five or up to ten days, and mature spores may appear six to eight days after inoculation, though under field conditions this period is usually lengthened to ten days or a fortnight.

Thompson (G. E.). **A leaf blight of Populus tacamahaca Mill. caused by an undescribed species of Linospora.**—*Canad. J. Res.*, Sect. C., xvii, 7, pp. 232–238, 1 pl., 2 figs., 1939.

A disease of *Populus tacamahacca*, which is stated to occur in Alberta, British Columbia, Ontario, and Quebec, is ascribed to *Linospora tetraspora* n. sp. The disease causes severe damage to the foliage on young trees and on the lower branches of the older trees; the lesions vary considerably in size, have irregular and diffused margins, and are dark brown on the upper and reddish brown on the under surface of the leaf. Eventually the entire leaf may become discoloured, and numerous small, black, circular or irregular pseudoclypei then develop on the upper surface. No true conidial stage of the fungus was found, but a spermatial stage was observed in the lesions during late summer and autumn, the acervuli, in which the spermatia were produced, arising within the epidermal cells of the upper surface of the leaf. No species of *Linospora* has been recorded on poplars in North America, and the fungus under investigation differs from those occurring on poplar in Europe (*L. populina* and *L. candida*) in having longer asci and ascospores, and four-spored asci. The new species, of which a Latin diagnosis is given, is described as having black, epiphyllous, densely scattered pseudoclypei, composed of dark mycelium in the epidermal cells; pseudostromata, 400 to 750 by 200 to 250 μ, develop beneath the pseudoclypei and

globose or piriform perithecia, 175 to 270 by 110 to 175 μ, usually occur singly in the pseudostromata; the beak of the perithecium arises laterally, then bends at a right angle to reach the leaf surface; the asci are cylindrical, straight or curved, tapering to a narrow base, rounded and thickened at the apex, 175 to 230 by 6·5 to 9 μ, and four-spored; the ascospores are filiform, straight or irregularly curved, with 6 to 8 septa, hyaline, 175 to 225 by 2·5 to 3 μ, and spirally twisted within the ascus.

In culture ascospores liberated from mature perithecia germinated within 24 hours, and slowly formed whitish, later brownish colonies; similar colonies were produced by plantings of infected leaf tissue, whereas single ascospores failed to grow. No fructifications were developed in culture. The pathogenicity of the fungus was demonstrated by inoculation of the terminal leaves on three branches of a healthy young tree of *P. tacamahacca* with a suspension of ascospores, the fungus being later reisolated from the diseased tissue.

Statutory rules and orders, 1939, No. 532. Destructive Insect and Pest Acts, England. The Importation of Plants Order of 1939. Dated May 16, 1939.—12 pp., 1939.

This order (which became effective as from 1st June, 1939), amends and consolidates the existing regulations (embodied in the Importation of Plant Orders of 1933 to 1938) [*R.A.M.*, xii, p. 799 *et passim*] affecting the importation of plants into England and Wales, which are now revoked. Corresponding regulations have been introduced in Scotland.

St. Lucia. Statutory Rules and Orders, 1939. No. 15. 24th June, 1939.—1 p., 1939.

In order to guard against the introduction of witches' broom disease of cacao [*Marasmius perniciosus*: *R.A.M.*, xvii, p. 801], this proclamation by the Governor in Council prohibits the importation into St. Lucia of any oil sands coming directly or indirectly from Trinidad.

Proclamation No. 8 of 1939.—*Nyasald Govt Not.* 37, 1 p., 1939. [Mimeographed.]

Proclamation No. 8 of 1939 (made under the Nyasaland Plant Pests and Diseases Ordinance [of 1924; *R.A.M.*, iv, p. 255]) prohibits the introduction into Nyasaland of plants or portions of plants (except the fruit) of grape vines, *Ampelopsis*, Virginia creeper [*Parthenocissus*], or other plant of the family Vitaceae, from the districts of Somerset West, Stellenbosch, Worcester, and Wynberg in Cape Province, South Africa, unless certified by the Union Department of Agriculture as free from bacterial blight (*Bacillus vitivorus*) [ibid., xviii, p. 498].

Service and regulatory announcements. January–March, 1939.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 138, pp. 31–53, 1939.

Summaries are given of the plant quarantine import restrictions in force in Albania, Bolivia, and Korea; revised import restrictions for Ceylon and the Gold Coast; and supplementary regulations for Australia, Malay, Nigeria, Jamaica, Greece, Yugoslavia, Rumania, and Italy. A list is also given of current domestic and foreign plant quarantine restrictions and miscellaneous regulations at present in force in the United States.